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Interrupted Time Series Analysis of Military and Civilian Regimes in Nigeria: A Statistical Evidence from Gross Domestic Product (GDP)

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Abstract

Governments influence the economy by changing the level and types of taxes, the extent and composition of spending, and the degree and form of borrowing. Governments directly and indirectly influence the way resources are used in the economy. Higher taxes, fees, and greater regulations can stymie businesses or entire industries and the resulting impact is reflected on the country's economy status (strong or weak). The growth rate of GDP is often used as an indicator of the general health of the economy. In broad terms, an increase in real GDP is interpreted as a sign that the economy is doing well. So it is important to study and pay more attention to country's GDP growth rate. In this paper, an intervention analysis approach was applied to Nigeria GDP data in order to evaluate the performances of military and civilian rules in the country. Data on Nigeria GDP were collected and subjected to interrupted (intervention) time series model. Based on the Alkaike Information Criterion (AIC), Bayesian Information Criterion (BIC) and sigma^2 values, the interrupted time series model ARIMA (1, 1, 0) with exogenous variables (per capita per capita GDP, intervention, year and yearAfter) was identified as the best model amongst other competing models. It was observed that the intervention (civilian rule) was significant at the 10% level of significance in increasing the Nigeria GDP by 10B US$ on the average since 2005 till 2021 while controlling for the effects of other determinants. Also, the ARIMA (1, 1, 0) forecasts indicate that the Nigeria GDP will continue increasing during the civilian rule. As a result, changing from military rule to civilian rule in Nigeria significantly increased the GDP of the country.

Keywords

ARIMA, Forecast, Gross Domestic Product, Nigeria, Intervention, Interrupted Time Series

1. Introduction

Since Nigeria gained its independence in 1960, two political regimes—the democratic regime and the military regime—have competed for power. The phrase "government of the people, for the people" is frequently used to describe democracies. It is a type of government that upholds the rule of law, majority rule while also respecting the rights of minorities, and encourages and permits citizenship rights like freedom of speech, religion, opinion, and association, establishing the rule of law, majority rule accompanied by consideration for minorities' rights. On the other hand, authoritarianism or dictatorship (the military) discourages the exercise of civic rights, which are frequently ignored in favor of the powerful special interests. Authoritarianism, according to [1], detests independent organizations, leading to their incorporation under centralized control or violent suppression.

Except for a brief period of further civilian rule between 1979 and 1983, the military had nonetheless maintained political control in Nigeria from 1966 to 1999. Nigerians learned throughout the military era that the military system has just as many flaws as democracy or civilian administration, if not more. Allegations of plundered treasuries, corruption, nepotism, the banning of media outlets, trade unions, and the establishment of civil society organizations were made. Numerous wrongful detentions, unexplained killings, assassinations, and prominent person disappearances occurred. All of this led to disenchantment, which caused many Nigerians to yearn for democracy, which materialized on May 29, 1999. Nigeria experienced two different political systems between 1960 and 2002: civilian control (democracy), from 1960 to 1966, 1979 to 1983, and May 1999 to the present, and military dictatorship, from 1966 to 1979; 1983 to May 1999.

Some Nigerians think that democracy is the only solution to the country's underdevelopment-related slavery. Nearly everyone in Nigeria is curious about the "dividends" that democracy can offer, especially now that it is in its "third regime." They would like to see these dividends include a rise in GDP. Others believe that given Nigeria's nature and variety of cultures, only a leadership with the use of force, such as the military, can promote economic growth and development. Due to conflicts arising from various ethnic groups, languages, customs and religious dichotomies, it is typically impossible to appease or pacify all the interest groups without the use of force. Therefore, a government without the element of coercion may choose to or be forced to lean towards one group of interests, which will fuel opposition from other groups and reduce GDP.

The important question now, however, is which form of political system in Nigeria produced a higher GDP between 1960 and the present. Which form of regime generates a higher GDP has not been widely agreed upon. The literature that is now available offers opposing viewpoints and findings. According to [2] and [3] economies that contain democratic components (such as openness) grow more quickly than others. However, research by other experts ([4] [5] [6]) demonstrates that democracy and its components, such as populist policies and civil liberties, slow down economic growth. [7] furthermore, provided empirical data to support the idea that some autocratic or dictatorial regimes can significantly boost economic growth.

In their study, [8] noted that Nigerians had not once felt relieved by good leadership, not even during the nationalist era, through independence, military dictatorship, and civilian interruptions. According to several studies, successful democracy is a stepping stone rather than a byproduct of development [9], and democracy is predicted to perform better than alternative types of governance [10].

According to some studies, the military government in Nigeria significantly influenced the socioeconomic development of the country through its policies ([11] and [12]), but [13] noted that such policies ultimately had no lasting impact on the economy and that the military should, at best, remain in its barracks. Cross-country variation is examined by [4] and [14], among others. [4] demonstrates that democracy's overall impact on growth is marginally detrimental but not significantly so. However, the author makes a case for a probable non-linear relationship in which democracy fosters economic growth under conditions of limited political rights but inhibits growth under conditions of increased freedom.

According to [14], democracy generally has a fairly detrimental effect. Other academics investigate when democracy fosters progress and when it does not. According to [15], significant democratic changes boost economic growth in the near run, notably for the poorest nations, and are also linked to a decrease in growth volatility. Several studies ([16] [17] [18] [19] and [20]) have found a favorable relationship between military spending and economic growth. However, other researchers have not discovered any substantial effects ([21] [22] [23] [24] and [25]).

However, other studies stress that the impact might differ among nations due to diverse political and economic conditions as well as the possibility that the link is not linear ([26] [27] [28] and [29]). There is therefore little agreement on what the impact of military spending on economic development might be [30]. As was mentioned earlier, the literature has produced conflicting findings regarding how democracy affects economic growth.

[31] used time series analysis on certain important economic indicators to look into the effects of democracy and military rule on the Nigerian economy. The outcome showed that, while both regimes significantly outperformed each

other in the four categories, seven of the eleven variables' performance during the democratic era improved more than during the military rule.

[32] looked at the connection between Nigeria's economic performance and its leadership style (civilian or military government). He used time series data and the ordinary least squares (OLS) technique for dummy variable. The study revealed no proof that, ceteris paribus, either military or civilian rules had a favorable impact on Nigeria's economic development.

[33] investigated and contrasted the agriculture sector's output in Nigeria during the military and under democracy. He went on to contrast government funding for the agricultural industry with funding for other industries. He used descriptive statistics as his analysis strategy. His findings demonstrated a favorable correlation between government spending on agriculture and agricultural productivity. This study demonstrated that Nigeria's democratic government invested more in the agricultural sector than the military government did, and as a result, the agricultural sector increased GDP more under democratic rule.

In Nigeria, [34] looked into the connection between economic success and the country's democratic system. Both the Johansen co-integration test and Ordinary Least Squares analysis (OLS) were used. The findings demonstrated the lack of a long-term equilibrium and the lack of a causal relationship between Nigerian democracy and economic expansion. On the other hand, there is a one-way causal relationship between corruption and democracy and between poverty and democracy (from poverty to democracy) (from corruption to democracy). According to OLS findings, unemployment, corruption, and democracy are all statistically significant. According to the study, GDP is lower in a military era than it is in a democratic one.

Based on the contributions of government spending on important economic sectors during the era, [35] compared democracy and military dictatorship in Nigeria. To calculate the short- and long-term effects of government spending on various sectors of the economy, they used the autoregressive distributed lag (ARDL) model. The analysis demonstrated that government spending on agriculture, education, and defense during the military era considerably and favorably contributed to economic growth in Nigeria although, in the short run, government spending on agriculture and defense slows growth. However, during the period of democracy, government spending on the agricultural and transportation/communications sectors helped Nigeria's economy thrive both over the long and short terms.

In 2016, [36] examined the effects of democratic governance on Nigeria's economic progress (fourth republic). The outcome of the OLS technique's use demonstrated that Democracy has a favorable effect on the economy.

Time-trend analyses were performed to several Nigerian growth variables as part of [37]'s statistical analysis of the Nigerian system of government to ascertain which regime has produced the highest degree of economic growth. The outcome reveals that while both regimes scored atrociously in the remaining four factors (NOXGDP, FDIGDP, FIMCAP, DISIND), while 7 out of the 11 variables (OPENSS, TEXGDP, RESGDP, GDPCAP, FODCAP, CAPCAP AND RESCAP) indicated higher results under democratic leadership compared to military administration. The full meaning and mathematical calculations of the variables are given in their paper.

[38] discussed adaptive regression modeling's use in nonlinear analyses of interrupted time series (ITS) data. It uses heuristic search, extended linear mixed models, and power transforms to account for nonlinearity. The study examined the effects of ITS on major birth defects in children of Vietnam War veterans, focusing on conception after and before their first tour. Results showed a significant adverse ITS interruption effect, possibly due to high dioxin exposure. Adaptive regression modeling can provide insights into nonlinear relationships over time and potentially vary with other predictors.

[39] research showed that military service can impact the health and wellbeing of families, as military families are embedded within a broader military context and culture. The study compared socioeconomic and social participation of military families with civilian families, finding significant income, education, and employment gaps. Younger age and decline in health status were key predictors of domestic violence assaults in military families. The review recommended further Australian-based research with military families and suggests preventative interventions to strengthen health, wellbeing, and socio-economic status.

Despite extensive study, discussion, writing, and research into the relationship between these two ideas, diverse outcomes nevertheless occur from different strategies used by the parties involved. Researchers have not yet found a definitive response to the subject at hand: which of the regimes significantly produce GDP? The most popular economic metric for assessing economic success, whether for intra- or inter-temporal comparison, is gross domestic product. According to [40], increasing the gross domestic product (GDP) is essential for pursuing the ongoing improvement and advancement that any country needs.

In this sense, this study is an extension of the ongoing debate about which regime (democratic or military) encourages economic growth by conducting a statistical analysis of the Nigerian system, which has both democratic and military regimes, in order to ascertain which regime has resulted in higher GDP levels. The specific objectives include:

1) Identify the best ARIMA model for Nigeria GDP data from 1966-2021;

2) Use the identified model for a time series regression with exogenous variables to check if intervention is significant;

3) Plot the intervention time series analysis;

4) Forecast and plot future values of the Nigeria GDP data.

This article is broken down into five sections. Therefore, following this Introduction are: Materials and Methods, Results and Discussion, Summary and Conclusion in this order.

2. Materials and Methods

In this section, the [41] methodology is briefly introduced with an extension to inclusion of regressors. Identification, fitting and evaluation of the autoregressive integrated moving average (ARIMA) are also discussed.

2.1. Box and Jenkin's Methodology

The Box-Jenkin's methodology for ARIMA models (dating back to time where computing resources were scarce) allows one to select the order of an $\text{AR}(p)$, $\text{MA}(q)$ or $\text{ARIMA}(p,d,q)$ by visual inspection of the (partial) correlograms. Both should always go alongside one another.

1) Apply a transformation of the data Y_t where appropriate

- logarithm, Box;Cox transform or;
- differencing so that the series appears linear.

2) Correlogram

- Determine the $\text{MA}(q)$ order by looking at the autocorrelation, at the points for which $\rho_k \neq 0$ for $k \leq q$ and $r_k \approx 0$ for $k > q$;
- For an $\text{AR}(p)$ process, the autocorrelation function should decay exponentially, with possible oscillation patterns;
- For an $\text{ARIMA}(p,d,q)$ model, the pattern is irregular for lags $k = 1,\cdots,p$, …, and go to zero as $k \to \infty$.

3) Partial Correllogram

- Parameters should be zero at lags $k > p$ for the $\text{AR}(p)$ model, and non-zero otherwise;
- The parameters decay exponentially in the $\text{MA}(q)$ model;
- The parameters decrease to zero as $k \to \infty$ for the $\text{ARIMA}(p,d,q)$ model.

Note: d represents the order of differencing, if the data was not subjected to differencing, $d = 0$.

The autoregressive model of order p, $\text{AR}(p)$ can be written as in (1)

$$y_t = c + \phi_1 y_{t-1} + \phi_2 y_{t-2} + \cdots + \phi_p y_{t-p} + \varepsilon_t \quad (1)$$

where

ε_t is white noise;

y_{t-p} are lagged values of y_t up to order p;

$\phi_1,\cdots,\phi_p$ are the model parameters.

Equation (1) has the following constraints on the parameter:

. for an AR(1) model: $-1 < \phi_1 < 1$;

. for an AR(2) model: $-1 < \phi_2 < 1$, $\phi_1 + \phi_2 < 1$, $\phi_1 - \phi_2 < 1$.

In this paper, $p > 3$, R program took care of the complicated restrictions.

The moving average model of order q, $\text{MA}(q)$ can be written as in (2)

$$y_t = c + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \cdots + \theta_q \varepsilon_{t-q} \quad (2)$$

where

y_t is the weighted moving average of the past few forecasts' errors.

Equation (2) has the following constraints on the parameter:

. for an MA(1) model: $-1<\theta_1<1$;

. for an MA(2) model: $-1<\theta_2<1$, $\theta_1+\theta_2<1$, $\theta_1-\theta_2<1$.

Again, for $q>3$, R program took care of the complicated restrictions.

The combination of the Equations (1) and (2) gives the full model as written in (3)

$$y'_t = c+\phi_1 y'_{t-1}+\phi_2 y'_{t-2}+\cdots+\phi_p y'_{t-p}+\theta_1\varepsilon_{t-1}+\theta_2\varepsilon_{t-2}+\cdots+\theta_q\varepsilon_{t-q}+\varepsilon_t \quad (3)$$

where

y'_t is the differenced series.

Given that y'_t is differenced, then we call Equation (3); $\text{ARIMA}(p,d,q)$ where

p is the order of the autoregressive part;

d is the number of times the series is differenced;

q is the order of the moving average part.

In this paper, regressors were added to Equation (3) for forecasting as follows:

$$\begin{aligned} &y'_t-\phi_1 y'_{t-1}+\phi_2 y'_{t-2}+\cdots+\phi_p y'_{t-p} \\ &=c+\theta_1\varepsilon_{t-1}+\theta_2\varepsilon_{t-2}+\cdots+\theta_q\varepsilon_{t-q}+\varepsilon_t+\beta_r\left(X_{rt}-\phi_1 X_{rt-1}\right) \end{aligned} \quad (4)$$

where

X_{rt} represents the $r=1,2,3$ and 4 regressors indexed in time (t);

β_r represents the regression parameters $\beta_r, r=1,2,3$ and 4;

β_1 is the regression parameter for X_1 a count variable which indicates the years passed (Year) from 1966;

β_2 is the regression parameter for X_2 a dummy variable indicating GDP value before $(X_2=0)$ or after $(X_2=1)$ the civilian rule (1999);

β_3 is the regreesion parameter for X_3 a count variable indicating years passed since the civilian rule started (where before civilian rule started $X_3=0$ and after civilian rule has started $X_3=1,2,3,\cdots$ till the last observation);

β_4 is the regression parameter for X_4 which is the per capita GDP.

The interrupted time series model has been extensively discussed in [42].

2.2. Model Selection Metrics

The order of the model suggested by inspecting the ACF, PACF and series plots will be compared with other competing model orders. Some of the model selection metrics used in this paper include:

i. Akaike's Information Criteria (AIC) = $2\times k-2\times\ln\left(\hat{L}\right)$ (5)

where $\hat{L}$ is the maximum value of the likelihood function for the model in Equation (4)

k = number of estimated parameters in the model.

ii. Bayesian Information Criteria (BIC) = $K\times\ln(n)-2\times\ln\left(\hat{L}\right)$ (6)

where

n is the number of data points in the observed data.

iii. log likelihood of the data: This is the logarithm of the probability of the observed data coming from the estimated model. The larger the log likelihood, the better the model.

Note: smaller values of AIC, BIC with maximum log likelihood indicate a better model.

In this study, computer software (R programming language and Python) is used to obtain the estimates of the model.

3. Results and Discussions

In this section, we described the data structure, identified breakpoints and date, identified the model, fitted the model, evaluated the model and used the model to forecast future values of Nigeria GDP.

3.1. Data Structure

The data used for this paper is presented and described in Table 1. Our main interest is in the Gross Domestic Product (GDP) and the regressors—per capita

Table 1. Nigeria gross domestic product from 1966-2021.

Date	GDP (Billions of US $)	Per Capita	Year After	Intervention	Year
12/31/1966	6.366793	124.3078	0	0	1
12/31/1967	5.203136	99.4061	0	0	2
12/31/1968	5.200896	97.2017	0	0	3
12/31/1969	6.634187	121.2454	0	0	4
12/31/1970	12.54585	224.1045	0	0	5
12/31/1971	9.18177	160.2487	0	0	6
12/31/1972	12.27442	209.226	0	0	7
12/31/1973	15.16287	252.2327	0	0	8
12/31/1974	24.84664	402.8499	0	0	9
12/31/1975	27.77893	438.3313	0	0	10
12/31/1976	36.30888	556.7022	0	0	11
12/31/1977	36.03541	536.2162	0	0	12
12/31/1978	36.52786	527.3113	0	0	13
12/31/1979	47.25991	662.264	0	0	14
12/31/1980	64.20179	874.4021	0	0	15
12/31/1981	164.4752	2180.198	0	0	16
12/31/1982	142.7694	1843.909	0	0	17
12/31/1983	97.09491	1222.629	0	0	18
12/31/1984	73.48436	902.2158	0	0	19
12/31/1985	73.74582	882.52	0	0	20
12/31/1986	54.80585	639.0131	0	0	21

Continued

12/31/1987	52.67604	598.2649	0	0	22
12/31/1988	49.64847	549.2374	0	0	23
12/31/1989	44.00306	474.232	0	0	24
12/31/1990	54.0358	567.5286	0	0	25
12/31/1991	49.11843	502.9141	0	0	26
12/31/1992	47.79493	477.1776	0	0	27
12/31/1993	27.7522	270.224	0	0	28
12/31/1994	33.83304	321.3207	0	0	29
12/31/1995	44.06247	408.181	0	0	30
12/31/1996	51.07582	461.5196	0	0	31
12/31/1997	54.45784	479.9838	0	0	32
12/31/1998	54.60405	469.4305	0	0	33
12/31/1999	59.37261	497.8416	1	1	34
12/31/2000	69.44876	567.9307	1	2	35
12/31/2001	74.03036	590.3818	1	3	36
12/31/2002	95.38582	741.7475	1	4	37
12/31/2003	104.9119	795.3862	1	5	38
12/31/2004	136.386	1007.874	1	6	39
12/31/2005	176.1341	1268.384	1	7	40
12/31/2006	236.104	1656.425	1	8	41
12/31/2007	275.6257	1883.461	1	9	42
12/31/2008	339.4762	2259.114	1	10	43
12/31/2009	295.0088	1911.608	1	11	44
12/31/2010	361.4566	2280.437	1	12	45
12/31/2011	404.9936	2487.598	1	13	46
12/31/2012	455.5015	2723.822	1	14	47
12/31/2013	508.693	2961.549	1	15	48
12/31/2014	546.6764	3098.986	1	16	49
12/31/2015	486.8033	2687.48	1	17	50
12/31/2016	404.65	2176.003	1	18	51
12/31/2017	375.7465	1968.565	1	19	52
12/31/2018	397.1905	2027.779	1	20	53
12/31/2019	448.1204	2229.859	1	21	54
12/31/2020	432.2938	2097.093	1	22	55
12/31/2021	440.777	2085.031	1	23	56

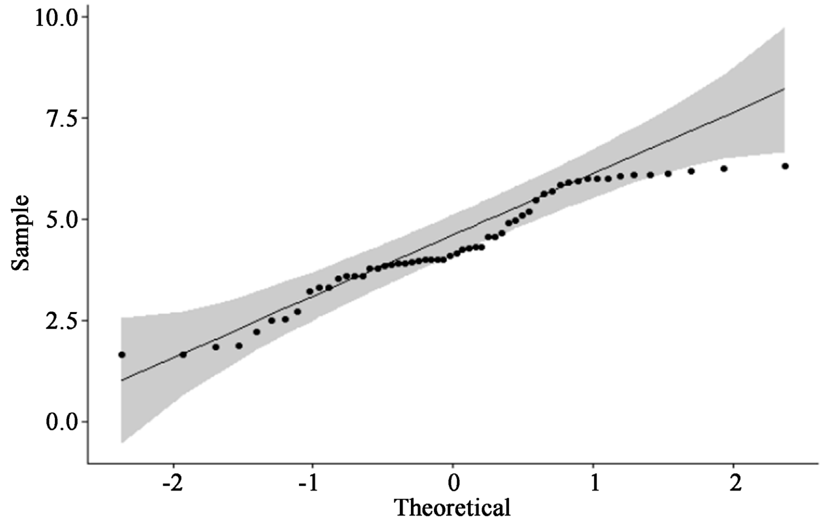

Figure 1. Quantile-quantile plot of Nigeria gross domestic product (1966-2021).

GDP, Year After, Intervention and Year. The regressors retain the meanings as defined in Equation (4). We used the qqplot (quantile-quantile plot) of the ggplot library of R programming language to test if the GDP series is normally distribution. The qq plot is given in **Figure 1**.

The **Figure 1** shows that the GDP series can be asymptotically normally distributed and therefore can be used for the time series analysis. The basic statistics of the regressors is presented in **Table 2**.

In **Table 2**, the per capita GDP (one of the regressors) data is normally distributed since skewness is between −2 to +2 and kurtosis is between −7 to +7 ([43] and [44]). The number of observations is 56 which corresponds to 56 years (1966-2021). Under "Intervention", the maximum value of 23 shows that it is now 23 years since intervention (civilian rule) started. The Nigeria GDP time series data from 1966-2021 is plotted in **Figure 2**.

3.2. Interrupted Time Series Analysis using Box and Jenkin's Methodology

Considering **Figure 2** the Nigerian GDP is seen to rise from the year 2000 upwards and fall around 2018. This is an indication that there was some break points in the series. A breakpoint is when there is a significant drop or rise in the series. The pattern of the time series plot suggests that the series is not stationary. We therefore verify it with plot of the rolling mean and standard deviations, Augmented Dickey Fuller test, Autocorrelation and Partial Autocorrelation function plots. The plot of the rolling mean and standard deviations is shown in **Figure 3**, Autocorrelation and Partial Autocorrelation function plots are shown in **Figure 4** and the Augmented Dickey Fuller test results in **Figure 5**.

3.2.1. Model Identification

A rolling mean can help you find trends that would otherwise be hard to detect. Volatility is based on standard deviation, a measure of how much the data

Table 2. Basic statistics of the regressors.

Statistics	per_capita GDP	Year After	Intervention	Year
nobs	56	56	56	56
NAs	0	0	0	0
Minimum	97.2017	0	0	1
Maximum	3098.986	1	23	56
1. Quartile	467.452775	0	0	14.75
3. Quartile	1925.84725	1	9.25	42.25
Mean	1081.087586	0.410714	4.928571	28.5
Median	618.639	0	0	28.5
Sum	60,540.9048	23	276	1596
SE Mean	117.022935	0.066336	0.980941	2.179449
LCL Mean	846.568383	0.277773	2.962722	24.132286
UCL Mean	1315.606789	0.543655	6.894421	32.867714
Variance	766,884.5733	0.246429	53.885714	266
Stdev	875.71946	0.496416	7.340689	16.309506
Skewness	0.745527	0.353298	1.157997	0
Kurtosis	−0.898006	−1.908307	−0.167611	−1.26445

LCL is lower class limit, UCL is upper class limit, SE is standard error, nobs is number of observations, NAs indicates missing value.

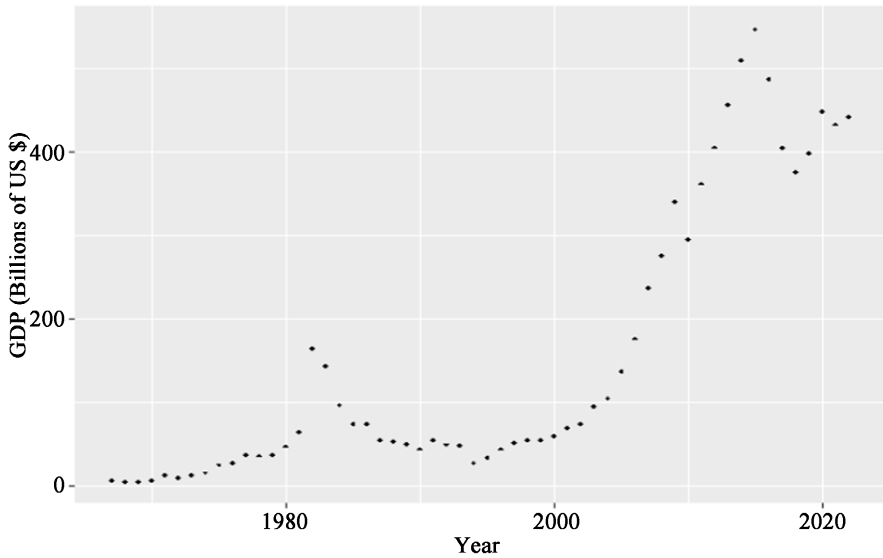

Figure 2. Time series plot of the Nigerian GDP (1966-2021).

(GDP) varies from the average or the measure of spread. The rolling mean and standard deviations plot in Figure 3 showed an irregular pattern and were obviously below the original series, the ACF plot in Figure 4 died off slowly with

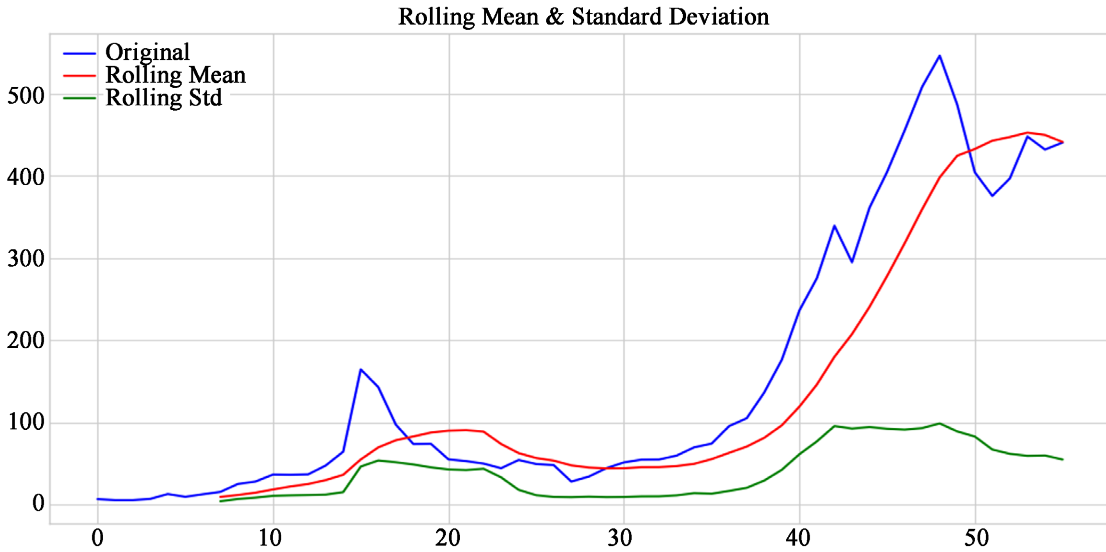

Figure 3. Plot of the rolling mean and standard deviation of the actual series.

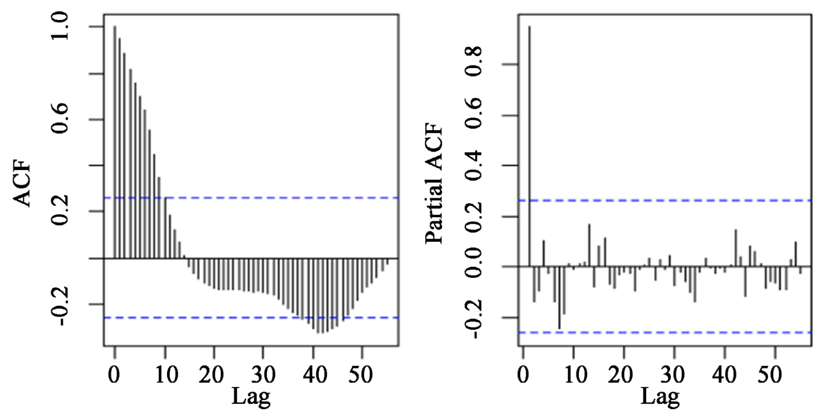

Figure 4. ACF and PACF plots of the actual series (Nigeria GDP data).

```
        Augmented Dickey-Fuller Test

data:  mydata_ts
Dickey-Fuller = -1.4832, Lag order = 3, p-value = 0.783
alternative hypothesis: stationary
```

Figure 5. Augmented Dickey-Fuller test results of the actual series (Nigeria GDP data).

only one significant spike at lag 1 in the PACF and the p-value > 0.05 in **Figure 5** suggesting that the observed series is not stationary and requires transformation. Therefore the series was differenced and the various plots re-plotted in **Figure 6** & **Figure 7**.

Again, the rolling mean and standard deviations plot in **Figure 6** still has an irregular pattern but has started going over the original series but only one significant spike at lag 1 in the PACF of **Figure 7** and the p-value > 0.05 in **Figure 8** suggesting that the observed series is still not stationary and requires further transformation. Therefore the series was differenced the second time and the various plots re-plotted in **Figures 9-11**.

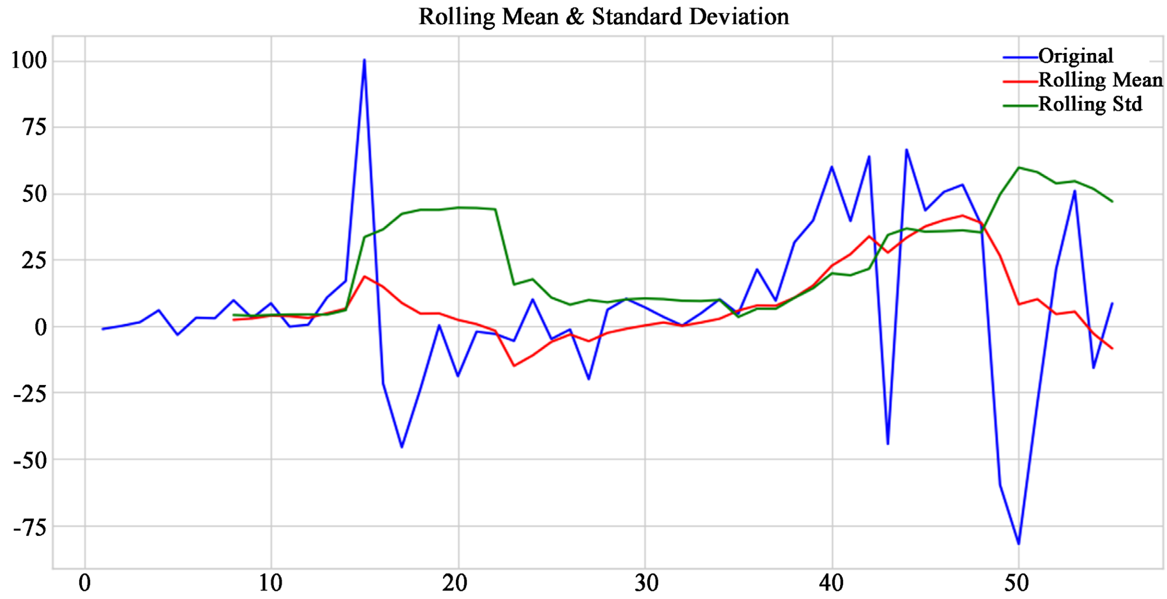

Figure 6. Plot of the rolling mean and standard deviation of the first differenced series.

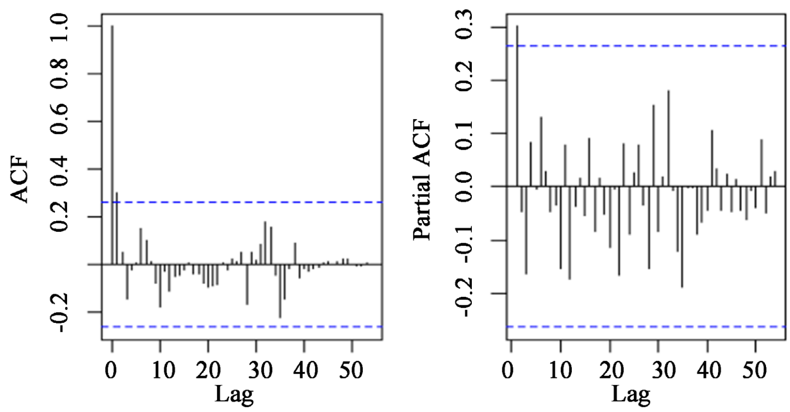

Figure 7. ACF and PACF plots of the first differenced series.

```
        Augmented Dickey-Fuller Test

data:  diff1
Dickey-Fuller = -3.3397, Lag order = 3, p-value = 0.07455
alternative hypothesis: stationary
```

Figure 8. Augmented dickey-fuller test results of the first differenced.

The plots in **Figure 9** (regular pattern of the rolling mean and standard deviations, the rolling standard deviation is now clearly above the original series), **Figure 10** (not just one spike above the significant limit at lag one) and the ADF test results in **Figure 11** is significant ($p < 0.05$), show that the series is finally stationary after second differencing. Considering the ACF plot in **Figure 10**, two spikes significantly crossed the confidence line in the negative side suggesting MA(2), the PACF plot also has two significant spikes that crossed the confidence line, this suggests order of the AR = 2. Since the series is differenced twice to make the series stationary, then d = 2. The combined order of the ARIMA model

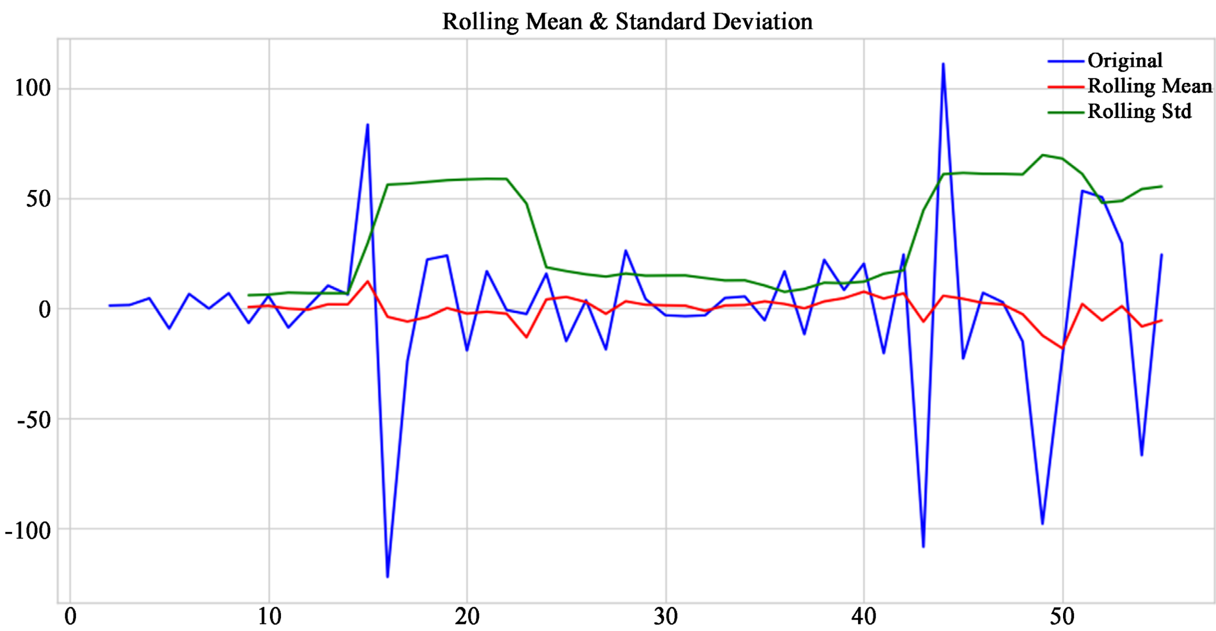

Figure 9. Plot of the rolling mean and standard deviation of the second differenced series.

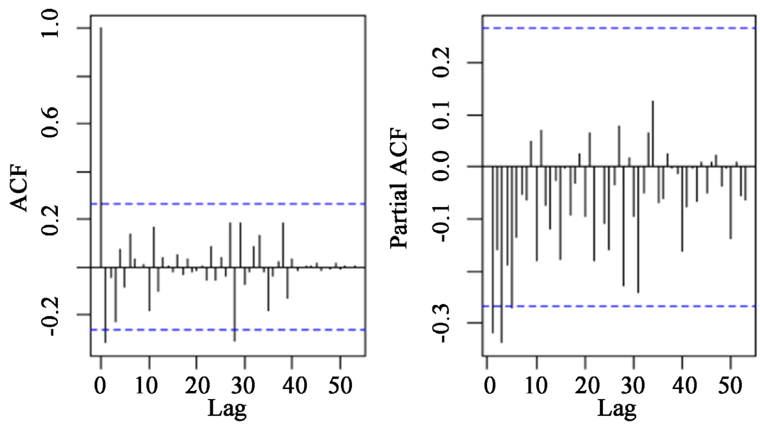

Figure 10. ACF and PACF plots of the second differenced series.

```
        Augmented Dickey-Fuller Test

data:  diff2
Dickey-Fuller = -5.6231, Lag order = 3, p-value = 0.01
alternative hypothesis: stationary

Warning message:
In adf.test(diff2) : p-value smaller than printed p-value
```

Figure 11. Augmented dickey-fuller test results of the second differenced series.

is (2, 2, 2). Other competing ARIMA model orders will be tried and compared with this suggested model.

3.2.2. Structural Changes and Break Point

To verify that there is a significant structural change in Nigeria GDP, we regressed GDP data against a constant, e.g. 1. The result is presented in Table 3.

Given that $p < 0.05$ in Table 3, it suggests the presence of structural change in the Nigeria GDP data. The structural breaks are identified in Table 4.

Considering Table 4, the best fit for the structural breaks is in the fifth breakpoint (m = 5) corresponding to observations 13, 21, 30, 38 and 46 since m = 5 minimized the residual sum square (RSS) and Bayesian Information Criterion (BIC). The fit is plotted in Figure 12 for better judgment.

The fits plotted in Figure 12 also suggests that five (m = 5) structural breakpoints exists in the Nigeria GDP data. We proceed to identify the best point in Figure 13.

From Figure 13, the confidence interval for the best structural break point showed that the lower limit is 39, mean is 40 and the upper limit is 41. This means we can choose any breakpoint to correspond to observation number between 39 and 41. In this study, we have chosen observation number 40 being the mean (corresponding to year 2005) as the best structural breakpoint. The

Table 3. Investigation of structural change.

Coefficients:					
	Estimate	Std. Error	t value	Pr (>|t|)	
(Intercept)	154.28	22.33	6.908	0.000 ***	
Signif. codes:	0 '***'	0.001 '**'	0.01 '*'	0.05 '.'	0.1 '' 1
Residual standard error: 167.1 on 55 degrees of freedom					

Table 4. Identification of structural breaks in Nigeria GDP data.

Optimal (m + 1)-segment partition:						
Call:						
breakpoints. formula(formula = mydata_ts ~ 1)						
Breakpoints at observation number:						
m = 1	40					
m = 2	38	46				
m = 3	13 38	46				
m = 4	13	21	38	46		
m = 5	13	21	30	38	46	
Corresponding to break dates:						
m = 1	40					
m = 2	38	46				
m = 3	13 38	46				
m = 4	13	21	38	46		
m = 5	13	21	30	38	46	
Fit:						
m	0	1	2	3	4	5
RSS	1,536,375.7	177,635.8	131,768.6	110,933.6	105,047.6	102,262.9
BIC	739.3	626.5	617.8	616.2	621.2	627.8

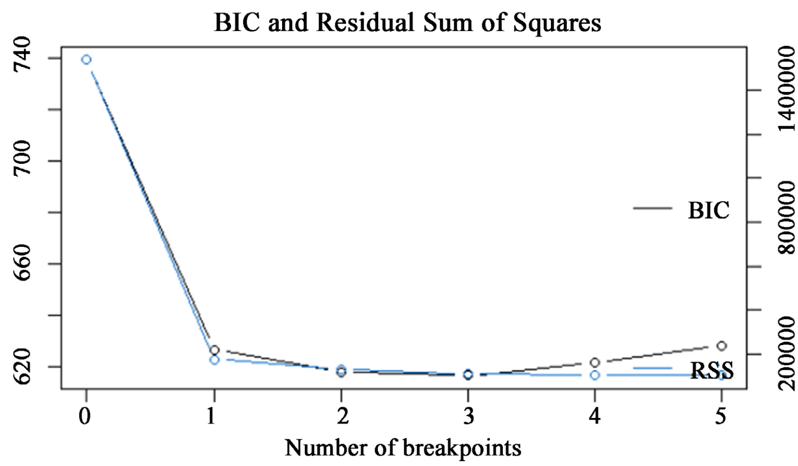

Figure 12. Plot of the fits for the structural breaks.

```
         Confidence intervals for breakpoints
         of optimal 2-segment partition:

Call:
confint.breakpointsfull(object = break_point, breaks = 1)

Breakpoints at observation number:
  2.5 % breakpoints 97.5 %
1    39          40     41

Corresponding to breakdates:
  2.5 % breakpoints 97.5 %
1    39          40     41
```

Figure 13. Confidence interval of the best structural break point.

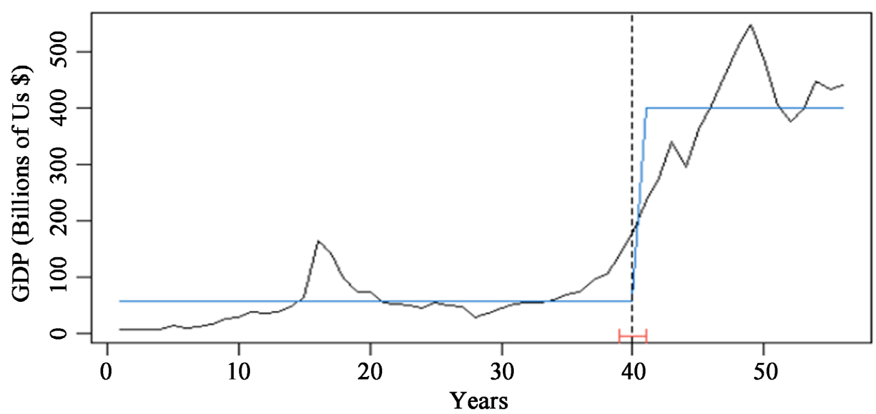

Figure 14. Plot of the series and the structural break confidence interval.

observed series is plotted with the structural breaks (the blue line) and the confidence interval of the structural break (the red line) in Figure 14. The observation number 40 is contained in the confidence interval.

After identifying the best structural breakpoint as observation number 40 (year 2005), we run Welch Two Sample t-test to check if the true difference in means is equal to 0 for GDP values years before 2005 and after 2005. The Welch two sample t-test is preferred because the Welch (unpooled variance) t-test does not make assumptions with respect to equality of the variances; it can be used in a wider variety of situations. The result of the Welch test is shown in Figure 15.

The p-value < 0.05 suggests that the true difference in means is not equal to zero. This simply means that the mean GDP value for years after 2005 (400.56 B US$) is significantly different from the mean GDP values for years before 2005 (55.76 B US$). This supports our choice for observation number 40 (corresponding to year 2005) as the best breakpoint.

3.2.3. Model Selection

Now the various models are compared in Table 5.

Based on the metrics in Table 5, since ARIMA (1, 1, 0) minimized AIC, BIC, Sigma^2 with corresponding maximized Log likelihood, we conclude that ARIMA (1, 1, 0) is the best ARIMA with the listed exogenous variables. The model is presented in Table 6.

Based on the p-values of the ar.L1, per capital GDP and Intervention regression parameters, these parameters are significant at 5% except for intervention which is significant at 10% (p-value < 0.1). Interpreting the "intervention" parameter, one unit increase in the number of years the country was on civilian (democratic regime) significantly increased the GDP by 9.54 units at 10% level of significance. This means that civilian rule significantly improved Nigerian GDP by approximately 10B US$ when other determinants of GDP growth are held constant. The Ljung-Box p-value = 0.69 which is the probability of getting a value as large as or larger than that observed under the null hypothesis that the true innovations are independent is not less than alpha value = 0.05, we conclude that the errors are independent. The Jarque-Bera (JB) statistics which is a

```
        Welch Two Sample t-test

data:  win_1 and win_2
t = -15.498, df = 18.047, p-value = 7.148e-12
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -391.5380 -298.0698
sample estimates:
mean of x mean of y
 55.76591 400.56983
```

Figure 15. Welch two sample t-test.

Table 5. Comparison of various models.

ARIMA	BIC	AIC	Sigma^2	Log likelihood
(1, 1, 0)	444.948	432.904	123.163	−210.452
(2, 2, 2)	455.712	437.811	126.670	−209.906
(1, 2, 1)	445.705	431.782	126.284	−208.891
(1, 2, 0)	458.426	446.496	185.913	−217.246
Min	444.948	431.782	123.163	
Max				−208.891

goodness-of-fit test that measures if sample data has skewness and kurtosis that are similar to a normal distribution is not close to zero, it shows that the sample data (Nigeria GDP) do not have a normal distribution. The White's Lagrange multiplier test for heteroscedasticity p-value = 0.07 is not less than 0.05 alpha level which means that the variance of residuals is constant. The residuals of the ARIMA (1, 1, 0) were checked in Figure 16.

Table 6. ARIMA (1, 1, 0) with exogenous variable.

```
                               SARIMAX Results
==============================================================================
Dep. Variable:                    GDP   No. Observations:                   56
Model:                 ARIMA(1, 1, 0)   Log Likelihood                -210.452
Date:                Thu, 29 Dec 2022   AIC                            432.904
Time:                        14:11:23   BIC                            444.948
Sample:                             0   HQIC                           437.562
                                 - 56
Covariance Type:                  opg
================================================================================
                   coef    std err          z      P>|z|      [0.025      0.975]
--------------------------------------------------------------------------------
Per_Capital      0.1030      0.003     38.202      0.000       0.098       0.108
YearAfter       -6.6120     50.018     -0.132      0.895    -104.645      91.421
Intervention     9.5392      5.210      1.831      0.067      -0.673      19.751
Year             0.3418      4.555      0.075      0.940      -8.586       9.269
ar.L1            0.2734      0.087      3.155      0.002       0.104       0.443
sigma2         123.1630     18.454      6.674      0.000      86.994     159.332
=====================================================================================
Ljung-Box (L1) (Q):                   0.16   Jarque-Bera (JB):                20.61
Prob(Q):                              0.69   Prob(JB):                         0.00
Heteroskedasticity (H):               2.40   Skew:                            -0.97
Prob(H) (two-sided):                  0.07   Kurtosis:                         5.28
=====================================================================================
```

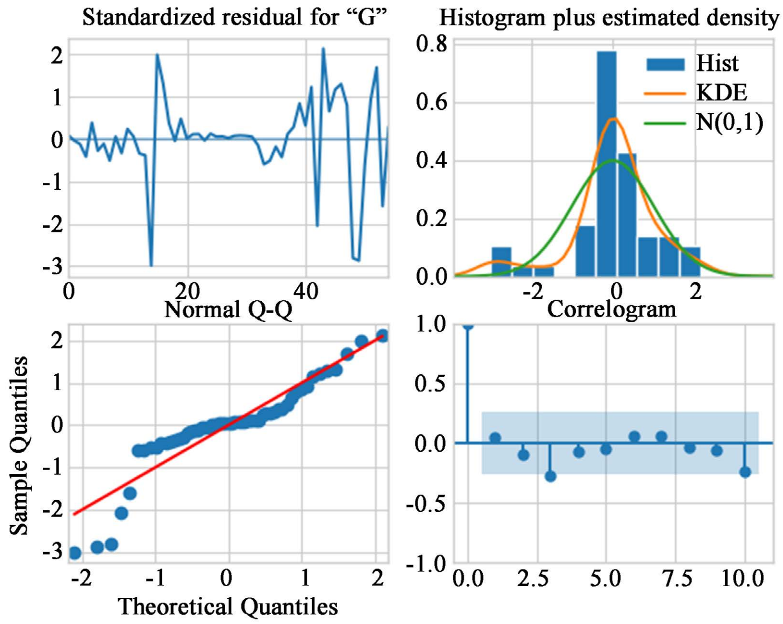

Figure 16. Residual analysis of ARIMA (1, 1, 0) with exogenous variables.

3.3.4. Model Evaluation

The errors of the model is further investigated to be white noise or not to know the suitability of the model for prediction.

The errors of the chosen ARIMA (1, 1, 0) with exogenous variables given in Figure 16 is a white noise since there is no pattern in the plot of the standardized residuals (constant variance), no significant autocorrelation crossed the confidence line (independency) and the errors follow N (0, 1). The plot of the intervention analysis is shown in Figure 17.

The legends of Figure 17 make easy to trace and understand the intervention analysis. However, the counterfactual (the black circular dots) is the line that shows the growth of the Nigeria GDP assuming civilian rule was not introduced. While the blue circular dots (the actual Nigeria GDP data) were closely predicted by the ARIMA (1, 1, 0) model (the blue line running through the blue circular dots). Observed that the actual Nigeria GDP data went higher than the counterfactual and its confidence interval, which implies that the introduction of Civilian rule significantly improved the Nigeria GDP data above what it was supposed to be with the military rule. The red line standing on observation number 40 is the intervention line signifying year 2005. This is the year from which the civilian rule began to significantly improve the Nigeria GDP, all thanks to President Olusegun Obansanjo (GCFR) the Nigerian President as at 2005. The ARIMA (1, 1, 0) with exogenous variables is used for forecasting the Nigeria GDP from 2021 till 2076. The forecast is presented in Figure 18.

3.2.5. Forecasting with the Model

The forecast in Figure 18 suggests that Nigeria GDP predicted to continue increasing during the civilian rule. The GDP actual, predicted values and % prediction errors are showed in Table 7.

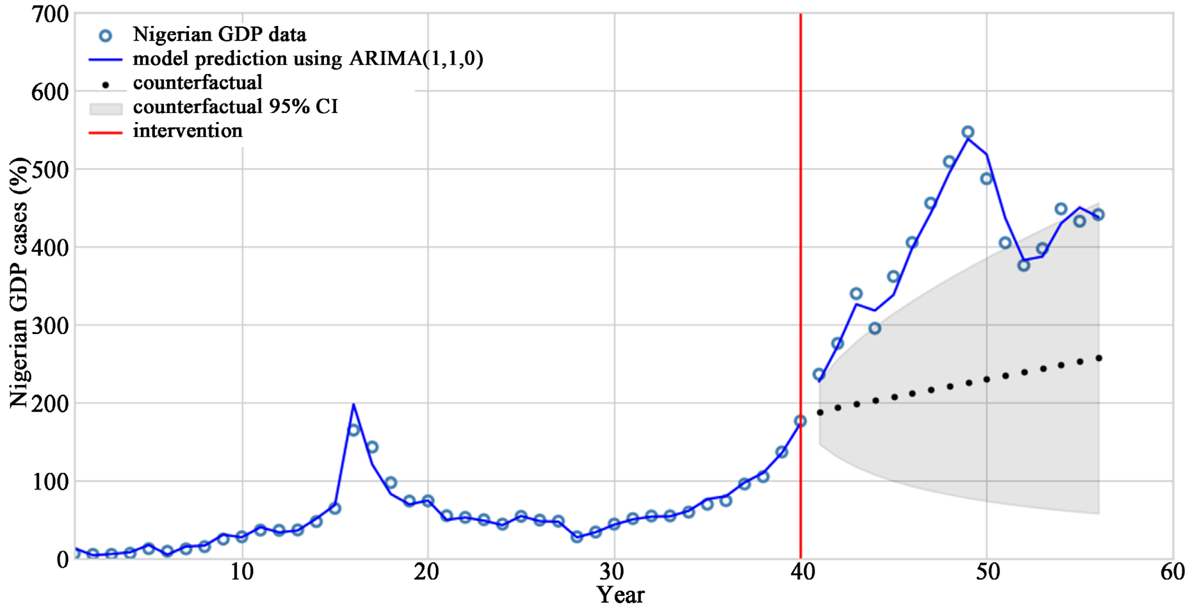

Figure 17. Intervention analyses of Nigeria GDP data (1966-2021)—military and civilian rule.

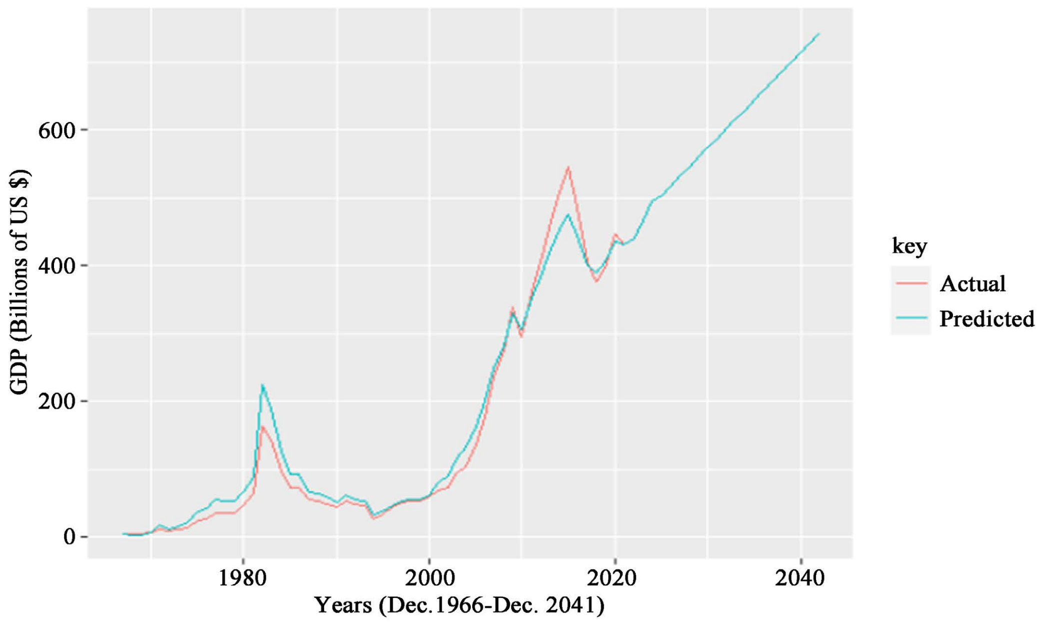

Figure 18. Plot of forecast values of Nigeria GDP (2021-2041).

Table 7. Nigeria GDP and predictions in Billion US$ for year (1966-2021).

Date	Actual	Predicted	% error	Per Capita GDP	Year After	Intervention	Year
12/31/1966	6.37	5.96	−6.32%	124.31	0	0	1
12/31/1967	5.20	3.85	−26.07%	99.41	0	0	2
12/31/1968	5.20	4.07	−21.80%	97.20	0	0	3
12/31/1969	6.63	6.99	5.39%	121.25	0	0	4
12/31/1970	12.55	18.04	43.76%	224.10	0	0	5
12/31/1971	9.18	11.91	29.66%	160.25	0	0	6
12/31/1972	12.27	17.40	41.74%	209.23	0	0	7
12/31/1973	15.16	22.28	46.92%	252.23	0	0	8
12/31/1974	24.85	38.24	53.91%	402.85	0	0	9
12/31/1975	27.78	42.34	52.43%	438.33	0	0	10
12/31/1976	36.31	54.99	51.44%	556.70	0	0	11
12/31/1977	36.04	53.32	47.97%	536.22	0	0	12
12/31/1978	36.53	52.85	44.69%	527.31	0	0	13
12/31/1979	47.26	67.20	42.20%	662.26	0	0	14
12/31/1980	64.20	89.51	39.41%	874.40	0	0	15
12/31/1981	164.48	224.48	36.48%	2180.20	0	0	16
12/31/1982	142.77	190.28	33.28%	1843.91	0	0	17
12/31/1983	97.09	126.72	30.52%	1222.63	0	0	18
12/31/1984	73.48	94.16	28.14%	902.22	0	0	19

Continued

12/31/1985	73.75	92.58	25.54%	882.52	0	0	20
12/31/1986	54.81	67.94	23.97%	639.01	0	0	21
12/31/1987	52.68	64.19	21.86%	598.26	0	0	22
12/31/1988	49.65	59.59	20.02%	549.24	0	0	23
12/31/1989	44.00	52.31	18.88%	474.23	0	0	24
12/31/1990	54.04	62.37	15.42%	567.53	0	0	25
12/31/1991	49.12	56.16	14.33%	502.91	0	0	26
12/31/1992	47.79	53.96	12.89%	477.18	0	0	27
12/31/1993	27.75	33.08	19.21%	270.22	0	0	28
12/31/1994	33.83	38.79	14.66%	321.32	0	0	29
12/31/1995	44.06	48.19	9.37%	408.18	0	0	30
12/31/1996	51.08	54.13	5.99%	461.52	0	0	31
12/31/1997	54.46	56.48	3.72%	479.98	0	0	32
12/31/1998	54.60	55.84	2.27%	469.43	0	0	33
12/31/1999	59.37	62.16	4.70%	497.84	1	1	34
12/31/2000	69.45	79.16	13.98%	567.93	1	2	35
12/31/2001	74.03	91.25	23.26%	590.38	1	3	36
12/31/2002	95.39	116.62	22.26%	741.75	1	4	37
12/31/2003	104.91	131.92	25.75%	795.39	1	5	38
12/31/2004	136.39	163.59	19.95%	1007.87	1	6	39
12/31/2005	176.13	200.20	13.67%	1268.38	1	7	40
12/31/2006	236.10	249.96	5.87%	1656.43	1	8	41
12/31/2007	275.63	283.12	2.72%	1883.46	1	9	42
12/31/2008	339.48	331.60	−2.32%	2259.11	1	10	43
12/31/2009	295.01	305.58	3.58%	1911.61	1	11	44
12/31/2010	361.46	353.35	−2.24%	2280.44	1	12	45
12/31/2011	404.99	384.47	−5.07%	2487.60	1	13	46
12/31/2012	455.50	418.58	−8.11%	2723.82	1	14	47
12/31/2013	508.69	452.85	−10.98%	2961.55	1	15	48
12/31/2014	546.68	476.78	−12.78%	3098.99	1	16	49
12/31/2015	486.80	444.17	−8.76%	2687.48	1	17	50
12/31/2016	404.65	401.25	−0.84%	2176.00	1	18	51
12/31/2017	375.75	389.66	3.70%	1968.57	1	19	52
12/31/2018	397.19	405.53	2.10%	2027.78	1	20	53
12/31/2019	448.12	436.13	−2.68%	2229.86	1	21	54
12/31/2020	432.29	432.23	−0.01%	2097.09	1	22	55
12/31/2021	440.78	440.76	0.00%	2085.03	1	23	56

Consider the % error column of Table 7, the mean of the total % errors was 15.53% which resulted to 84.47% mean prediction accuracy for the ARIMA (1, 1, 0) model. The % prediction errors are seen to reduce to zero as we predict towards the current years and this tells us that the model will give better forecast for the future years. The % prediction errors are plotted and shown in Figure 19.

The values of the regressors used for the forecast were obtained as follow:

1) The per capita GDP data was regressed on Year variable in Table 7 to obtain a simple regression equation: $\text{per capita GDP} = -87.62 + 41.01(\text{Year})$ with R-square value of 58.00%. This equation was used to predict the per capita GDP values for the years we want to forecast (2022-2041).

2) The three other regressors (Year After, Intervention and Year) were coded continuing from Table 7. The data and the forecast values of Nigeria GDP for year 2022-2041 are given in Table 8.

4. Summary

In this study, we have been able to:

1) Identify the ARIMA (1, 1, 0) model as the best model for Nigeria GDP data from 1966-2021 (see Table 5). This is because while it was compared with other competing models, it had the smallest BIC, AIC and sigma^2 values.

2) The ARIMA (1, 1, 0) model was fitted with exogenous variables (per capita GDP, Year After, Intervention and Year). The intervention variable was significant at 10% alpha level ($p < 0.1$), see Table 6.

3) The intervention was plotted in Figure 17.

4) Predicted and forecasted values of the Nigeria GDP were plotted in Figure 18 and also given in Table 7. The forecast was for periods between (2022-2041).

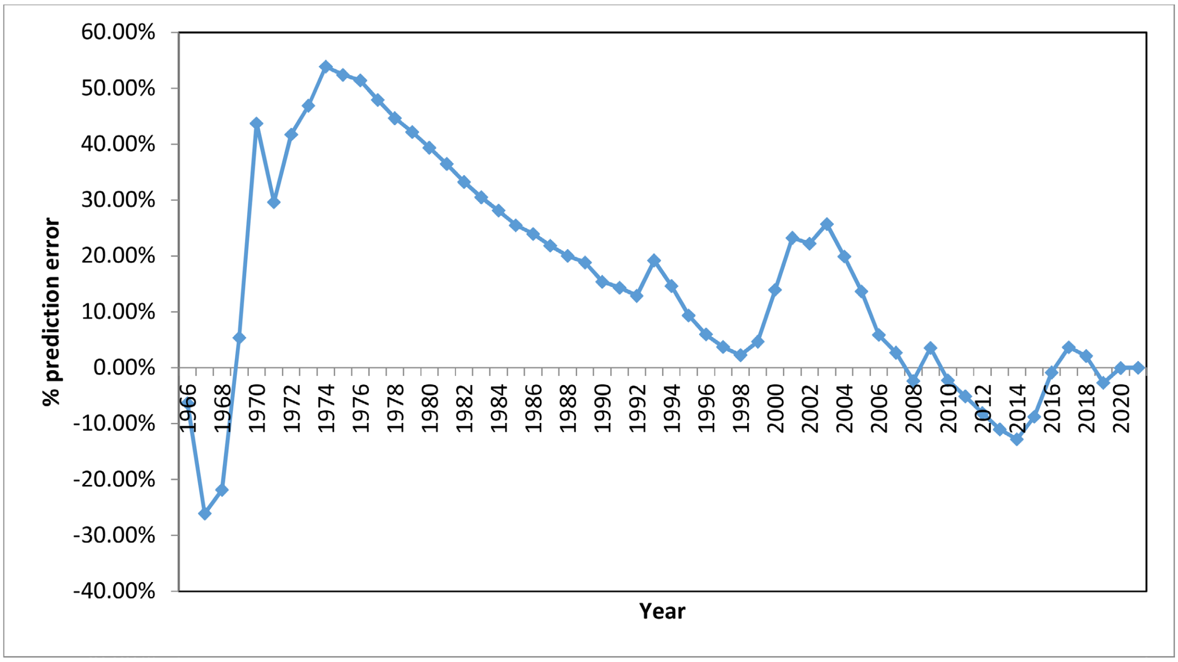

Figure 19. Plot of the percentage prediction errors.

Table 8. Forecast values of the Nigeria GDP values (2022-2041).

Date	GDP Forecast	Per Capital GDP	Year After	Intervention	Year
12/31/2022	467.5137	2249.793	1	24	57
12/31/2023	494.7661	2419.425	1	25	58
12/31/2024	504.5428	2419.425	1	26	59
12/31/2025	518.5441	2460.432	1	27	60
12/31/2026	532.5454	2501.439	1	28	61
12/31/2027	546.5468	2542.446	1	29	62
12/31/2028	560.5481	2583.453	1	30	63
12/31/2029	574.5494	2624.46	1	31	64
12/31/2030	588.5507	2665.468	1	32	65
12/31/2031	602.552	2706.475	1	33	66
12/31/2032	616.5534	2747.482	1	34	67
12/31/2033	630.5547	2788.489	1	35	68
12/31/2034	644.556	2829.496	1	36	69
12/31/2035	658.5573	2870.504	1	37	70
12/31/2036	672.5586	2911.511	1	38	71
12/31/2037	686.56	2952.518	1	39	72
12/31/2038	700.5613	2993.525	1	40	73
12/31/2039	714.5626	3034.532	1	41	74
12/31/2040	728.5639	3075.54	1	42	75
12/31/2041	742.5653	3116.547	1	43	76

5. Conclusions

The findings of this study are in agreement with extant literatures like [2] [3] and [10] which proposed that economies that contain democratic components (civilian rule) grow more quickly than others. This study has now provided statistical evidence that civilian rule has better improved the Nigeria GDP than the military rule. This evidence was lacking in the work of [32] that attempted to look at the connection between Nigeria's economic performance and its leadership style (civilian or military government). The interrupted time series model used in this study is superior to the time series and OLS models used by [32] because while it predicted and forecasted future values of the Nigeria GDP; it also identified structural change, structural break and structural breakpoint (date) in the data which helped to determine the effect of the intervention (civilian rule) on the Nigeria GDP from 1966-2021.

We have also discovered in this study that the rolling mean and standard deviation plot can be used for checking stationarity in the following ways:

i. For non-stationary series, the rolling mean and standard deviation plot results to the mean and standard deviations falling below the original series;
ii. For stationary series, the mean settles on the same line with the original series while the standard deviation goes a little above the two (the mean and the original series).

Author Contributions

Section one (Introduction): OUC and EFA, Section two (Materials and Methods): BDC, Section three (Results and Discussions): BDC and UGU, Section Four and Five (Summary and Conclusion): BDC and UGU. All authors read and corrected the final draft manuscript.

Data Availability

http://www.macrotrends.net/

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Przeworski, A. and Limongi, F. (1993) Political Regimes and Economic Growth. *Journal of Economic Perspectives*, **7**, 51-69. https://doi.org/10.1257/jep.7.3.51

[2] Friedman, M. (1962) Capitalism and Freedom. University of Chicago Press, Chicago, 133.

[3] Scully, G.W. (1988) The Institutional Framework and Economic Development. *Journal of Political Economy*, **96**, 652-662. https://doi.org/10.1086/261555

[4] Barro, R.J. (1994) Democracy and Growth. National Bureau of Economic Research, Cambridge. https://doi.org/10.3386/w4909

[5] Horowitz, I.L. (1966) Three Worlds of Development. Oxford University Press, New York.

[6] Odetola, O. (1982) Military Regimes and Development: A Comparative Analysis in African Societies. Allen & Unwin, London, 105.

[7] Chete, L.N. and Robert, F. (1996) Government and The Economy: Review of Concepts and Perspectives on Nigeria's Economy, beyond Adjustment. *Proceedings of the Annual Conference on beyond Adjustment*: *Management of the Nigeria Economy*, Ibadan, 6-8 March 1996.

[8] Okafor, J.C. and Okafor, U.C. (2015) ECOWAS and Democratic Reversal in West Africa: Re-Visiting Military Incursion on State Leadership. http://www.iiste.org/Journals/index.php/IAGS/article/view/26390/12/11/2015/12.23pm

[9] Acemoglu, D., Johnson, S. and Robinson, J.A. (2005) Institutions as a Fundamental Cause of Long-Run Growth. In: Aghion, P. and Durlauf, S.N., Eds., *Handbook of Economic Growth*, Vol. 1, Part A, Elsevier, Amsterdam, 385-472. https://doi.org/10.1016/S1574-0684(05)01006-3

[10] Siegle, J.T., Weinstein, M.M. and Halperin, M.H. (2005) Why Democracies Excel.

Foreign Affairs, **83**, 57-71. https://doi.org/10.2307/20034067

[11] Eminue, O. (2006) Military in Politics. Soulmate Press and Publishers, Uyo.

[12] Ekele, S. (2011) Issues and Problems of Military and Politics in Africa. Musuve Publishing Company, Nairobi.

[13] Bamgboye P.O. (2014) The Military and Socio-Economic Development in Nigeria (1983-1999): A Critical Appraisal. *Mediterranean Journal of Social Sciences*, **5**, 2340-2344. https://doi.org/10.5901/mjss.2014.v5n23p2340

[14] Tavares, J. and Wacziarg, R. (2001) How Democracy Affects Growth. *European Economic Review*, **45**, 1341-1378. https://doi.org/10.1016/S0014-2921(00)00093-3

[15] Rodrik, D. and Wacziarg, R. (2005) Do Democratic Transitions Produce Bad Economic Outcomes? *The American Economic Review*, **95**, 50-55. https://doi.org/10.1257/000282805774670059

[16] Mueller, M.J. and Atesoglu, H.S. (1993) Defense Spending, Technological Change and Economic Growth in the United States. *Defence Economics*, **4**, 259-269. https://doi.org/10.1080/10430719308404765

[17] Murdoch, J.C., Pi, C.-R. and Sandler, T. (1997) The Impact of Defense and Non-Defense Public Spending on Growth in Asia and Latin America. *Defence and Peace Economics*, **8**, 205-224. https://doi.org/10.1080/10430719708404876

[18] Shieh, J.-Y., Lai, C.-C. and Chang, W.-Y. (2002) The Impact of Military Burden on Long-Run Growth and Welfare. *Journal of Development Economics*, **68**, 443-455. https://doi.org/10.1016/S0304-3878(02)00022-6

[19] Wijewerra, A. and Webb, M.J. (2011) Military Spending and Economic Growth in South Asia: A Panel Data Analysis. *Defence and Peace Economics*, **22**, 545-554. https://doi.org/10.1080/10242694.2010.533905

[20] Yildirim, J., Sezgin, S. and Öcal, N. (2005) Military Expenditure and Economic Growth in Middle Eastern Countries: A Dynamic Panel Data Analysis. *Defence and Peace Economics*, **16**, 283-295. https://doi.org/10.1080/10242690500114751

[21] Benoit, E. (1973) Defense and Economic Growth in Developing Countries. Lexington Books, Lexington.

[22] Biswas, B. and Ram, R. (1986) Military Expenditures and Economic Growth in Less Developed Countries: An Augmented Model and Further Evidence. *Economic Development and Cultural Change*, **34**, 361-372. https://doi.org/10.1086/451533

[23] Deger, S. and Smith, R. (1983) Military Expenditure and Growth in Less Developed Countries. *Journal of Conflict Resolution*, **27**, 335-353. https://doi.org/10.1177/0022002783027002006

[24] Maizels, A. and Nissanke, M. (1986) The Determinants of Military Expenditures in Developing Countries. *World Development*, **14**, 1125-1140. https://doi.org/10.1016/0305-750X(86)90115-4

[25] Nincic, M. and Cusack, T. (1979) The Political Economy of US Military Spending. *Journal of Peace Research*, **16**, 101-115. https://doi.org/10.1177/002234337901600202

[26] Aizenman, J. and Glick, R. (2006) Military Expenditure, Threats, and Growth. *Journal of International Trade & Economic Development*, **15**, 129-155. https://doi.org/10.1080/09638190600689095

[27] Kentor, J. and Kick, E. (2008) Bringing the Military Back in: Military Expenditures and Economic Growth 1990 to 2003, *Journal of World-Systems Research*, **14**, 142-172. https://doi.org/10.5195/jwsr.2008.342

[28] Pieroni, L. (2009) Military Expenditure and Economic Growth. *Defense and Peace*

Economics, **20**, 327-339. https://doi.org/10.1080/10242690701589876

[29] Yang, A., Trumbull, W., Yang, C. and Huang, B. (2011) On the Relationship between Military Expenditures and Economic Growth: A Nonlinear Approach. *Defense and Peace Economics*, **22**, 449-457. https://doi.org/10.1080/10242694.2010.497723

[30] Dunne, J.P., Smith, R.P. and Willenbockel, D. (2005) Models of Military Expenditure and Growth: A Critical Review. *Defence and Peace Economics*, **16**, 449-461. https://doi.org/10.1080/10242690500167791

[31] Anyiwe M.A. and Oziegbe, A. (2006) Democracy and Economic Growth: Statistical Evidence from Nigeria 1960-2002. *Journal of Applied Sciences*, **6**, 257-265. https://doi.org/10.3923/jas.2006.257.265

[32] Kagochi, J. (2008) Leadership Style Influence on Economic Growth in Nigeria. *Journal of Economic Theory*, **2**, 101-106.

[33] Ehigiamusoe, U. (2012) A Comparative Analysis of Agricultural Performance between the Military and Civilian Regimes in Nigeria. *International Journal of Humanities and Social Science Invention*, **1**, 13-23.

[34] Umaru, A., Adeyemi, G. and Kehinde, B.E. (2014) Democracy and the Performance of the Nigerian Economy. *International Journal of Humanities and Social Science*, **4**, 191-207.

[35] Babalola, B., Salako, A.,Yusuf, S. and Egbekunle, S. (2015) Comparative Analysis of Sectoral Civilian and Military Governments Expenditures on Economic Growth in Nigeria: Ardle Approach. *Journal of Applied Economics and Business*, **3**, 52-73.

[36] Yunana, T., Yunana, Y. and Muhammad, D. (2016) An Empirical Analysis of Democracy Governance and Economic Development in Nigeria. *Journal of Advances in Political Science*, **2**, 50-54.

[37] Anyiwe, M.A. and Oziegbe, A. (2006) Democracy and Economic Growth: Statistical Evidence from Nigeria 1960-2002. *Journal of Applied Sciences*, **6**, 257-265. https://doi.org/10.3923/jas.2006.257.265

[38] Knafl, G.J. (2022) Adaptive Regression for Nonlinear Interrupted Time Series Analyses with Application to Birth Defects in Children of Vietnam War Veterans. *Open Journal of Statistics*, **12**, 789-809. https://doi.org/10.4236/ojs.2022.126045

[39] Jiang, H., Dowling, R., Hameed, M., Painter, F., Vuong, A., Booth, A., Opie, J., Boh, J., McLean, N. and McIntosh, J. (2022) Comparison of Social and Economic Stress in Military and Civilian Families: A Rapid Review of the Evidence. *Open Journal of Social Sciences*, **10**, 320-347. https://doi.org/10.4236/jss.2022.1011022

[40] Hashim, E., Norimah, R., Nurhanani, A., Norasibah, A., Syazwani, M.B. and Ng, W.R. (2018) Determinants of Real GDP in Malaysiam. *The Journal of Social Sciences Research*, **3**, 97-103. https://doi.org/10.32861/jssr.spi3.97.103

[41] Box, G. and Jenkins, G. (1970) Time Series Analysis: Forecasting and Control. Holden-Day, San Francisco.

[42] Bartholomew, D.C., Nwaigwe, C.C., Orumie, U.C. and Nwafor, G.O. (2023) Intervention Analysis of COVID-19 Vaccination in Nigeria: The Naïve Solution versus Interrupted Time Series. *Annals of Data Science*. https://doi.org/10.1007/s40745-023-00462-8

[43] Hair, J., Black, W.C., Babin, B.J. and Anderson, R.E. (2010) Multivariate Data Analysis. 7th Edition, Pearson Educational International, New York.

[44] Byrne, B.M. (2010) Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming. Routledge, New York.