INFLATIONARY AND RECESSIONARY PRESSURE IN NIGERIA (COHARANE ORCUTT ITERATIVE AND ARIMA MODEL METHODS)

Dr. Idoko Cletus Usman and Wada Emmanuel O.

Department of Economics, Kogi State University, Anyigba

ABSTRACT: *Nigerian economy is technically in Recession. This is because it has been smacked hard by the pressure of economic recessionary, caused by inflationary pressure, sky-scraping exchange rate, unemployment rate, interest rate and tax rate. This makes it imperative for the paper to examine inflationary and recessionary pressure in Nigeria. The study used multiple regression analysis on time series data which spanned the period of 1986-2016 with the aid of Coharane Orcutt iterative method to correct autocorrelation or serial correlation on selected macroeconomic variables based on the model employed. The results revealed negative contributions of these macroeconomic variables such as inflation rate, exchange rate, unemployment rate, interest rate and tax rate on Gross Domestic Product as proxy to measure recessionary pressure in Nigeria. This was attributed to the fact that a fall in economic growth proxy by GDP for two consecutive quarters in an economy is an evidence of economic recession. The study further examined the performance of the forecasting ability of the model, and how well the simulated series track the actual data. In doing this, historical simulation of the model was carried out. Thus, it was observed that, ARIMA model performed well in different periods and ARIMA was also considered good as a benchmark model. The study recommended that Nigeria needs optimistic economic revolution through relative price stability, devaluation of naira, diminution of unemployment rate (provision for self employment), moderate rise in interest rate and finally reduced tax rates on individuals, small businesses, and corporations by lowering the tax rate by at least 10% points.*

KEYWORDS: Recessionary, Inflationary, Coharane Orcutt Iterative and ARIMA

INTRODUCTION

The triumph of recessionary and inflationary targeting is largely dependent on the effectiveness of monetary and fiscal policy framework. Achieving this goal requires some ability to sneak a look into close proximity in future. Thus, decision makers are expected to make forecasts or predictions to aid in decision making. To conduct these forecasts or predictions, most central banks take a number of variables such as Gross Domestic Product as proxy for economic growth vis-à-vis measure of recessionary pressure and inflation rate as proxy for inflationary pressure into account (Feridun and Adebiyi, 2005).

Under Recessionary and inflationary pressure targeting in an economy, central banks commit to a target level of economic growth to avoid recession and place inflation at the barest minimum level, usually over a one year period (Feridun and Adebiyi, 2005). Thus, for a country to achieve its recession and inflation targeting goals it needs dynamic recession and inflation forecasting model that is able to simulate the effect of shocks in monetary and fiscal policies on macroeconomic variables such as Gross Domestic Product (GDP) and inflation rate. Also, the importance of recession and inflation forecasting model depends on their

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ability to capture recession and inflation expectations, which serve as channels by which monetary and fiscal policies transmit to the real sector of the economy.

According to the National Bureau of Economic Research (2016), recession is "a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in a Gross Domestic Product (GDP), real income, employment, industrial production and wholesale-retail sales." Economic recession is a negative Gross Domestic Product (GDP) growth rate for two consecutive quarters; that is both first and second quarters within a fiscal year in an economy. it is no longer rumor going by the above descriptions that Nigeria is experiencing economic recession currently, since her first and second quarters growth in 2016 are recorded to be -0.36% and -1.5% (CBN, 2016).

During recession, there is usually a decline in certain macroeconomic indicators such as GDP, employment, investment spending, capacity utilization, household income, business income, and inflation, with the attendant increase in the rate of unemployment, (CBN, 2012).

Chinguwo and Blewit, (2012) posited that economic recession, financial crisis and climate change problems combined to make life even more difficult for many working people and their families. Consequently, economic recession, financial crisis and climate change problems on the average will lead to instability in the macroeconomic environment, thereby causing inflationary pressure as a result of hike in purchasing power of goods and service by the final consumers.

According to Mailafia, (2016), economic recession or recessionary pressure in any economy stagnates wage growth and increases the proportion of people on low pay, as well as swelling unemployment and underemployment. Bauer (2009) also conjectured that economic recession and the global financial crisis have inter-linkages with poverty incidence in developing countries. Similarly in the witty assertions of Oyesiku (2009), economic recession does not just occur, certain factors trigger recession which include; inflation, loss of consumer confidence, excess supply over demand, excess demand over supply, and global economic crisis.

According to National Bureau of Economic Research (2016), the present economic recession has severe negative and also some positive impacts on aggregate economic activities in Nigeria. It causes extreme poverty and suffering of the masses, children's right to quality education, affordable inclusive healthcare are deprived, leading to adverse demand and supply shocks. It also has contractionary effects on aggregate demand and supply resulting to volatile shocks in economic activities. Due to economic recession, there is usually scarcity of foreign exchange, few money, reduced income, decreased finances available to households and businesses. There is also weak purchasing power, reduced consumer spending and decrease in sales of goods and services. The purchase of goods and services by individuals, households and firms will drastically reduce as a result of the economic recession. Business activities are at the low ebb, there are jobs losses and increase in unemployment rate. The reduced employment is due to decreased sales of goods and services by business owners, companies, street vendors, farmers, shop owners, retailers and wholesalers. The aggregate spending power usually decline sharply as a result of inflationary pressure accompanied by economic recession in the Nigerian economy.

The National Bureau of Statistics (NBS, 2016), also confirmed that the 2016 economic recession in Nigeria was a full year recession, and the worst in the country's history since 1987. In 1987, according to World Bank statistic, Nigeria had a full year decline in Gross

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Domestic Product (GDP) which was put at 10.8%. The country recorded recessions in 1991 and 1995, recording a full year economic decline of 0.6 and 0.3 percent respectively (NBS, 2004).

NBS (2016), within the fiscal epoch of 2016, under the current President Buhari's administration, Nigeria's economy tipped into recession, largely due to oil price slumps and a trailing off of production. Despite recent reports that Nigeria is out of recession, the country's economy continues to suffer from its vulnerability to oil pricing, production swings and endemic corruption, as well as poor visioning that continually subvert sits potential to uplift the living standards of its citizens. Consequently, the decline in oil price led to unstable macroeconomic environment accompanied by inflationary pressure, high rate of unemployment, unfavourable exchange rate of naira in terms of dollar and coupled with problems of other macroeconomic indicators deteriorated Gross Domestic Product for two consecutive quarters which technically led Nigeria economy into economic recession.

According to (NBS, 2016) Nigeria recorded GDP contraction of 1.51 percent in 2016. "In the fourth quarter of 2016, the nation's Gross Domestic Product (GDP) contracted by -1.30% (year-on-year) in real terms, from ₦18, 533.75 billion in Q4 2015 to ₦18,292.95 billion in Q4 2016, "This decline was less severe than the decline recorded in the previous quarter, of -2.24%, but was nevertheless lower than the growth rate recorded in the final quarter of 2015, of 2.11%.. From one quarter to quarter another, real GDP increased by 4.09%, which partly reflects seasonal factors as well as a rise in the general price level. For the full year 2016, GDP contracted by -1.51%, indicating real GDP of ₦67, 984.20 billion, but this technically led Nigerian economy into recession (CBN, 2016).

According to (NBS, 2016), Nigerian economy as at the second quarter of 2017 recorded growth rate of 0.55%. In spite of this growth rate, the country could not say it has conquered recession because of the positive value of growth rate. This is due to the fact that unemployment is still high, inflation still above 15%, debt profile between 2015 to 2017 increased by 67%, exchange rate continues to deteriorate.

World Bank (2017) posited that evidence has shown that none of the economic indices of the recession has been conquered except a positive growth margin; no policy change has been adopted to get the country out of the economic jumble. The International Monetary Fund (IMF) as well as the Central Bank of Nigeria (CBN), came into conclusion that Nigeria economy has plunged into recession. They assert that Nigeria's economy may not regain stability until early 2017 with low growth rate of 1.5%.

The inflationary pressure which caused recessionary pressure in the Nigerian economy was further aggravated by high demand for imports of both intermediate inputs and consumer goods due to over valuation of the naira which made imports relatively cheaper than locally manufactured goods. Undoubtedly, this was one of the macroeconomic goals which the government strives to achieve is the maintenance of stable domestic price level. This goal was pursued in order to avoid cost of inflation or deflation and the uncertainty that follows where there is price instability (Salam et al, 2006).

Nigeria as a nation is by no means resistant to the danger of inflation and recession. Hence, after an appreciable economic performance in the early 1970s, the Nigerian economy witnessed some anxious moments in the late 1970s to mid 1980s. Severe pressures built up in the economy mainly because of the expansionary fiscal policy of the federal government during these years. This was accompanied by high monetary expansion as the huge

government deficit was financed largely by the Central Bank of Nigeria. This was exacerbated by the transfer of government sector deposits to the banks and the resultant increase in their free reserves with adverse consequences on the general price level. Consequently, Nigerian economy recorded inflation rate of 9.544% in the year 2015, but its average plight was no longer the same in the year 2016 due to pushy rise in inflation rate to 18.6% which technically led Nigerian economy into recession.

However, there is no research work with any form of lacuna; the most of the studies related to this area of study focused much attention on inflation and economic growth without considering the implication of inflation on economic recession. Hence, the motivating vigor of this study is to look at inflationary and recessionary pressure as well as forecast of recessionary pressure in the Nigerian economy.

CAUSAL FACTORS OF INFLATIONARY AND RECESSIONARY PRESSURE IN NIGERIA

According to (NBS, 2016), factors among high inflation led to economic recession in Nigerian economy. This resulted to a rise in general price of goods and services-leading to low purchasing power, accumulation of debt servicing especially foreign debts, high-interest rate which discourage investors, fall in aggregate demand, fall in wages, income, mass unemployment and general loss of confidence on the government due to economic indices among others. However, other factors identified to be the causes of economic recession in Nigeria were: Poor economic Planning, high Inflation rate resulted from high-interest rate, high taxation and policy conflict

Poor economic planning and no concrete implementation of economic planning has been identified as one of the major cause of Nigeria current recession; others are budget delay and exchange rate policy. Hence, the government has proclaimed the usual generalities that every government indulges itself in diversifying the economy, improving manufacturing/mining sector, raising agricultural output, encouraging foreign investment, among others, yet no concrete evidenced strategic plan for growth. No doubt, the government has taken some steps like the elimination of dollar purchase privileges for importers of 40 items such as – rice, cement, toothpicks, private planes, poultry, meats, margarine, wheelbarrows, textiles, and soaps (Lamido, 2016).

These actions have caused serious poverty in the land. In most cases, the government through her policies widens the gap between the rich and poor and creates more economic hardship. For instance, when the CBN was selling dollars at ₦315 and people were buying at N480, the highly placed individuals in the country were putting call across the banking industry to get dollar at the official rate. This they later resole at the parallel market rate of N480. This action results to fraudulent activity, injustice, and corruption to the highest order. An individual can make as much as ₦1billion naira without doing anything according to the former CBN governor (Lamido, 2016). The people who benefit mostly from this act were people who advocated for the devaluation the Naira. In such case, the poor usually pay the price of currency devaluation while the rich schemed off the profits. In this case, it is important to note that when crude oil price in the international market was very low and crude oil export was largely affected by the activities of Niger-Delta militants, Nigeria currency was devalued and as such the policy was useless because of the mono-product culture of the economy (Lamido, 2016).

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For example, if one dollar is taken from every $1 billion accruing to the Federation Account and resold by the CBN at ₦200 to the dollar, the government would have lost N100 billion that could have gone into payment of salaries, provision of agricultural inputs and expansion of healthcare services. Yet, the government usually goes into borrowing from international organizations to sponsor its major projects when dollars was cheaply sold to small group of people. This incidence leads to divaricating effect in governance (Lamido, 2016).

Usually, the consequences of some government policies especially the banning of the importation of certain essential agricultural products such as Rice without considering gestation period may have resulted to the hardship experienced by many Nigerians over the years.. Removal of fuel subsidy wouldn't have been simultaneous with the banning of these agricultural products.   This is because following the above effect; household price skyrocketed as many Nigerians found it difficult to purchase its basic necessities as inflation rate currently stood at 18.63% which was concerned the highest for past last decades (Lamido, 2016).

According to (Lamido, 2016), recessionary pressure in Nigeria also resulted out of pegged interest rate between 26.77% and 27%. It is extremely high for investors. This high interest rate is usually discouraging to investors. Hence, the poor investments due to high interest rate culminate into high rate of unemployment in the country, reduction in aggregate demand especially from the households. He further asserted that even during economic recession, Nigeria government charges high interest rate and high tax rates to investors. In this case, most small businesses are slaughtered with high interest rate and taxes. Both high interest and tax rate have lowered' aggregate demand Nigerians in Nigeria economy. This type of economic policies appears conflicting since high-interest rate and high tax rate are tight monetary policy measures, but government over the years adopted expansionary policy vis-a-viz budget deficit, yet Nigerian economy is under economic recession, what a paradox. It is this on this bases that the study propose to look at inflationary and recessionary pressure in Nigeria using coharane orcutt iterative and ARIMA model methods.

Research Questions

i.   Does inflationary pressure cause recessionary pressure in Nigeria?

ii. To what extent have macroeconomic variables such as exchange rate, unemployment rate, interest rate and tax rate contributed to recessionary pressure in Nigeria?

Objectives Of The Study

i.   To find out whether inflationary pressure cause recessionary pressure in Nigeria.

ii. To determine the contributions of macroeconomic variables such as exchange rate, unemployment rate, interest rate and tax rate to recessionary pressure in Nigeria.

Research Hypothesis

i. H_{01} : Inflationary pressure does not cause recessionary pressure in Nigeria.

ii. H_{02} : Macroeconomic variables such as exchange rate, unemployment rate, interest rate and tax rate do not contribute to recessionary pressure in Nigeria.

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LITERATURE REVIEW

Eneji, Dimis, & Rose (2017) examined the impact of Economic Recession on Macroeconomic Stability and Sustainable Development in Nigeria. The study used multiple regression analysis of time series data between 1980-2016 on selected macroeconomic variables in two econometric models. The results of the analysis show negative impact of these variables on economic growth and sustainable development. This study perceives that economic recession is a symptom of deeper structural problems inherent in the Nigerian economy, and overdependence on external modern capitalist societies. CBN (2012) indicates that in recession, there is usually a decline in certain macroeconomic indicators such as GDP, employment, investment spending, capacity utilization, household income, business income, and inflation, with the attendant increase in the rate of unemployment.

Chinguwo and Blewit (2012) posited that economic recession, financial crisis and climate change problems combined to make life even more difficult for many working population and their families in most developing countries like Nigeria.

Mailafia, (2016), economic recession stagnates wage growth and increases the proportion of people on low pay, as well as swelling unemployment and underemployment and discovered that economic recession and the global financial crisis have inter-linkages with poverty incidence in developing countries. Oyesiku (2009),opine that economic recession does not just occur anyhow, certain factors trigger recession which include; inflation, loss of consumer confidence, excess supply over demand, excess demand over supply, and global economic crisis.

Fabayo and Ajilore (2006) follow the methodology of Khan and Sendhaji (2001) to examine the existence of threshold effects in inflation-growth relationship using Nigeria data for the period of 1970-2003. The results suggest the existence of inflation threshold in the level of 6%. Below this level, there exists significant positive relationship between inflation and economic growth, while above this threshold level, inflation harms growth performance.

Munir and Mansur (2009) analyses the relationship between inflation rate and economic growth rate in the period of 1970-2005 in Malaysia. This evidence strongly supports the view that the relationship between inflation rate and economic growth is nonlinear. The estimated threshold regression model suggests 3.89% as the threshold value of inflation rate above which inflation significantly retards growth rate of GDP. In addition, below the threshold level, there is a statistically significant positive relationship between inflation rate and growth.

Frimpong and Oteng-Abayie (2010) analyze the threshold effect of inflation on economic growth in Ghana for the period of 1960-2008 by using threshold regression models. The result indicates inflation threshold level of 11% at which inflation starts to significantly hurt economic growth in Ghana. Below the 11% level, inflation is likely to have a mild effect on economic activities, while above this threshold level, inflation would adversely affect economic growth.

Shamim and Mortaza (2005) using annual data set on real GDP and CPI for the period of 1980 to 2005 and applying co-integration and error correction models examine inflation-growth nexus in Bangladesh. The empirical evidence demonstrates that there exists a statistically significant long-run negative relationship between inflation and economic growth for the country. In addition, the estimated threshold model suggests 6-percent as the threshold

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level (i.e., structural break point) of inflation above which inflation adversely affects economic growth.

Aham and Emeka (2012) examined the relative predictive power of ARIMA, VAR and ECM models in forecasting inflation in Nigeria. In doing this, a domestic Consumer Price Index(CPI) was lumped into headline (All Item). This is because decomposing Consumer Price Index will generate difficult task for monetary authority, since different factors determine inflation(CPI) under different types of CPI. Annual data that spanned from 1970-2010 were used. Comparatively, the study examines the performance of the forecasting ability of the models, and how well the simulated series track the actual data. In doing this, historical simulation of the models were carried out. Thus, it was observed that, different models performed well in different periods. While ARIMA is good as a benchmark model, VAR for short term forecasting and ECM is suitable for long run forecasting. The study shows that significant relationship exist between domestic CPI and exchange rate, US-CPI(foreign price) and government expenditure in predicting inflation movements in Nigeria.

Aminu and Anono (2012) investigate the effect of inflation on economic growth and development in Nigeria. They employed OLS, ADF and Granger causality and found that there is a positive correlation between inflation and economic growth in Nigeria, though the results revealed that the coefficient of inflation is not statistically significant, but is consistence with the theoretical expectation, causation runs from GDP to inflation implying that inflation does not Granger cause GDP but GDP does.

Joao and Francisco (2001) conduct research on does high inflation affect growth in the long and short-run in Brazil? They used Vector Autoregressive technique. They found a zero long-run response of output to a permanent inflation shock in the context of a high inflation country, and that inflation and output are reliably related in the long-run. The results indicated that in the short-run, there is a negative impact of inflation on output.

Mohsin and Abdelhak (2001) conduct research on threshold effects in the relationship between inflation and growth (a comparative study of industrial and developing countries) and found that the threshold is lower for industrialized countries than it is for developing countries. They also found negative and significant relationship between inflation and growth above the threshold level. They suggested low inflation for sustainable growth.

Vikesh and Subrina (2004) conducted research on the relationship between inflation and economic growth in Fiji, they used simple correlation and causality techniques and found that there was a weak negative correlation between inflation and growth, while a change in output bears significant bearing on inflation. The causality between the two variables ran one-way from GDP growth to inflation.

Mwansa (1998) estimated both an error correction and VAR model of inflation in Zambia using quarterly data on ECM he observed that the second lag of M_1 is marginally significant for inflation. In the VAR model, he found that shocks to M_1 explain 15% of the variations in inflation after one year, while shocks to the exchange rate explained as much as 22% of inflation variations after 6 months.

Valle, (2002), in his study of Guatemala economy, constructed ARIMA models as benchmarks with a view to determining the relevance of the variables included in VAR model in the forecasting on inflation. He noted that ARIMA models performed better during period of structural change than VAR model. The VAR model included variables like,

exchange rate, money supply (M_1 and M_2), interest rate (short or long term deposit rates), output (monthly index of economic activities) and oil price. Finally, the research result discovered that output (monthly index of economic activities) and international oil price performed better in forecasting inflation.

Aron and Muellbauer (2000) explored the monetary transmission implications of inflation forecasting for South Africa by estimating inflation and real output forecast, using a single equation multi-step forecasting techniques to avoid specification errors. The inflation model was carried out in an equilibrium correction form, which shows medium or long-run influences on inflation. They observed the importance of short-term interest rate, output gap, exchange rate, and current account surplus to GDP ratio for forecasting South Africa domestic inflation.

Agenor (1989), examined the trends in inflation in four African countries and, identified the important role parallel market exchange rates, as compared to official rates, and monetary expansion play in explaining both the decomposition of the forecast error variance of inflation rates and in estimating the response of the inflation rate to unit shocks to each of these variables.

Stock and Watson (2008) examined an extensive simulated out of sample inflation forecasts in US. In doing this they considered standard Philip curve forecasting models and observed that the major determinants of inflation include; employment-related variables such as unemployment rate, non-agric civilian employment, hourly earnings and output-related variables such as real GDP, index of industrial production, capacity utilization, exchange rate, import-prices and interest rate. Their study showed that the Philip curve performed better than other multivariate forecasts models, though occasionally in relative performance. A number of inflation studies have been carried out in developing countries which African countries are included.

Friedman and kuttner (1992) examined a VAR model-based forecasting for US with a view to derive a structural inflation function. They based their analysis on the F-statistics in order to determine the importance of monetary variables. They found that both narrow (M_1) and broad (M_2) money are significant for inflation before 1980 and were not when the data set was extended beyond that period. Particularly, they observed that commercial paper bill was significant. In response to this, Emery (1996) estimated recursive regression and used both Granger-Causality and variance decompositions and attributed the significant of commercial paper bill to the presence of outliers in the data.

RESEARCH DESIGN AND DATA

In an attempt to explore the recession and inflation forecasting model in Nigeria, the study employed Autoregressive Integrated Moving Average (ARIMA) techniques on variables such as GDP to measure recessionary pressure and inflation rate to measure inflationary pressure. In fitting ARIMA to the series, the study examines the autocorrelation properties. This procedure is known as identification and provides a benchmark in selecting ARIMA specification. In identifying ARIMA models, the study adopts the Box-Jenkins methodology. ARIMA model-selection criterion is employed to determine the optimal lag and model estimation. As observed by Valle (2002), the goal of ARIMA models is for forecasting inflation and to provide a benchmark for other forecasts model, because of versatility and flexibility..

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Secondary data mainly from the publications of the Central Bank of Nigeria (CBN) namely; CBN Statistical Bulletin and CBN Annual Reports, and National Bureau of Statistics publications were used. The model sought to investigate the recessionary and inflationary pressure in Nigeria within the timeframe of 1986 and 2016.

Usually, the acronym **ARIMA** stands for Auto-Regressive Integrated Moving Average. Lags of the stationarized series in the forecasting equation are called "autoregressive" terms, lags of the forecast errors are called "moving average" terms, and a time series which needs to be differenced to be made stationary is said to be an "integrated" version of a stationary series. **ARIMA** forecasting equation for a stationary time series is a linear (i.e., regression-type) equation in which the predictors consist of lags of the dependent variable and/or lags of the forecast errors.

MODEL SPECIFICATION

Coharane Orcutt Iterative

In order to avoid spurious regression result, we apply the coharane Orcutt iterative method of Generalized Least Squares (GLS) to solve the problem of autocorrelation. This is because the model specified is good for prediction and forecast, but not reliable. Hence, the model specified GDP as proxy for recessionary pressure and inflation rate as proxy for inflationary pressure, but it worth to be noted that inflationary pressure may likely cause recessionary pressure in the economy. Hence, the model specification utilized the double log model specification. Where the parentheses [ ] denote equations 1-9

[1] $lnGDP_t = F(lnINF_t, lnEXR_t, lnUPR_t, lnINTR_t, lnTAXR_t)$

The mathematical form of the model is specified below as:

[2] $lnGDP_t = \beta_0 + \beta_1 lnINF_t + \beta_2 lnEXR_t + \beta_3 lnUPR_t + \beta_4 lnINTR_t + \beta_5 lnTAXR_t$

The stochastic form of the model is specified below as:

[3] $lnGDP_t = \beta_0 + \beta_1 lnINF_t + \beta_2 lnEXR_t + \beta_3 lnUPR_t + \beta_4 lnINTR_t + \beta_5 lnTAXR_t + \mu$

The Coharane Orcutt iterative method of solving autocorrelation or serial correlation problem is specified below as:

[4] $lnGDP_t = \beta_0 + \beta_1 lnINF_t + \beta_2 lnEXR_t + \beta_3 lnUPR_t + \beta_4 lnINTR_t + \beta_5 lnTAXR_t + AR(1) + AR(2) + \mu$

The variables were as earlier defined in equation 2 and on a priori, we expect the estimates of $\beta_1 < 0$, $\beta_2 < 0$, $\beta_3 < 0$, $\beta_4 < 0$, and $\beta_5 < 0$. This is because based on a priori expectation ground, we expect that rise in inflation rate, and exchange rate, unemployment rate, interest rate and tax rate will on the average bring a fall in Gross Domestic Product in an economy. Hence, a fall in GDP for two consecutive quarters in an economy is an evidence of economic recession.

ARIMA MODEL SPECIFICATION

[5] $DGDP^* = \beta + \sum_{j=1}^{p} \alpha i \, dGDP * t - j + \varepsilon t$

The forecasting equation is constructed as follows.

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First, let y denote the d th difference of Y , which means:

[6] If d=0: $GDP_t = GDP_{t-1}$

[7] If d=1: $GDP_t = GDP_t - GDP_{t-1}$

[8] If d=2: $GDP_t = (GDP_t - GDP_{t-1}) - (GDP_{t-1} - GDP_{t-2}) = GDP_t - 2GDP_{t-1} + GDP_{t-2}$

Note that the second difference of GDP (the d=2 case) is not the difference from 2 periods ago. Rather, it is the first-difference-of-the-first difference, which is the discrete analog of a second derivative, i.e., the local acceleration of the series rather than its local trend. In terms of GDP, the general forecasting equation is:

[9] $GDP*_t = \mu + \phi 1 GDP_{t-1} + \ldots + \phi p GDP_{t-p} - \theta 1 + e_{t-1}$

Here the moving average parameters (θ's) are defined so that their signs are negative in the equation, following the convention introduced by Box and Jenkins

EMPIRICAL RESULTS AND FINDINGS

Table 1.0: REGRESSION RESULT

Dependent Variable: lnGDP
Method: Least Squares
Date: 11/02/17   Time: 21:33
Sample: 1986 2016
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.825736	1.636396	2.949003	0.0068
lnINF	-0.323393	0.153921	-2.101032	0.0304
lnEXR	-0.404781	0.085523	-4.733007	0.0000
lnUPR	-0.522277	0.191182	-2.731831	0.0106
lnINTR	-0.557997	0.496543	-1.123764	0.0427
lnTAXR	-0.605737	0.270660	-2.237999	0.0231

R-squared	0.942319	Mean dependent var		8.694299
Adjusted R-squared	0.930783	S.D. dependent var		1.976621
S.E. of regression	0.520030	Akaike info criterion		1.702126
Sum squared resid	6.760786	Schwarz criterion		1.979672
Log likelihood	-20.38295	Hannan-Quinn criter.		1.792599
F-statistic	81.68438	Durbin-Watson stat		0.823703
Prob(F-statistic)	0.000000			

Source: Author's Computation using Eviews 9.5

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Coharane Orcutt Iterative Method

(Correction for Autocorrelation Or Serial Correlation)

From table 1.0 above, it is observed based on the value of Durbin-Watson statistic (0.823703) that there is autocorrelation or serial correlation in the model specification. Hence, the Coharane Orcutt iterative method of AR (1) and AR (2) will be applied to solve the problem of autocorrelation. This is done in the form of Generalized Least Squares (GLS) and no longer Ordinary Least Squares (OLS) so as to avoid spurious regression analysis.

Where: AR (1) is Autoregressive of the lagged values 1 i.e. one year ago and

AR (2) is Autoregressive of the lagged values 2 i.e. two years ago

Table 2.0: Coharane Orcutt Iterative Method

Dependent Variable: LNGDP
Method: ARMA Maximum Likelihood (BFGS)
Date: 11/02/17   Time: 21:35
Sample: 1986 2016
Included observations: 31
Convergence achieved after 11 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.860629	2.492369	2.752654	0.0116
LNINF	-0.453398	0.104407	-4.342601	0.0009
LNEXR	-0.564784	0.177600	-3.180090	0.0052
LNUPR	-0.582274	0.144177	-4.038605	0.0013
LNINTR	-0.677992	0.186240	-3.640421	0.0323
LNTAXR	-0.685733	0.177478	-3.863763	0.0024
AR(1)	-1.589794	0.222518	-7.144568	0.0000
AR(2)	-0.597146	0.226873	-2.632073	0.0152
SIGMASQ	0.041272	0.012530	3.293703	0.0033

R-squared	0.989084	Mean dependent var		8.694299
Adjusted R-squared	0.985115	S.D. dependent var		1.976621
S.E. of regression	0.241154	Akaike info criterion		0.410686
Sum squared resid	1.279419	Schwarz criterion		0.827005
Log likelihood	2.634361	Hannan-Quinn criter.		0.546396
F-statistic	249.1846	Durbin-Watson stat		2.474165
Prob(F-statistic)	0.000000			

Inverted AR Roots	.98	.61	

Source: Author's Computation using Eviews 9.5

The intercept of the regression model in the table 1 above is 6.86. All things being equal, it represents the value of Gross Domestic Product (GDP) if inflation rate (INF), exchange rate (EXR), unemployment rate (UPR) interest rate (INTR) and tax rate (TAXR) are individually equal to zero.

The regression coefficient of inflation rate (INF) is -0.45. It shows that a 1% increase in inflation rate (INF) will bring about 45% decreases in Gross Domestic Product (GDP) in Nigeria. It is negative showing an inverse relationship between inflation rate (INF) and Gross Domestic Product (GDP) in Nigeria. Hence, inflationary pressure is one of the causal factors of recessionary pressure in Nigeria.

The regression coefficient of exchange rate (EXR), is -0.56. It shows that a 1% increase in exchange rate (EXR) will bring about 56% decreases in Gross Domestic Product (GDP) in Nigeria. It is negative showing an inverse relationship between exchange rate (EXR) and Gross Domestic Product (GDP). Hence, exchange rate contributed to recessionary pressure since it has negative impact on GDP in Nigeria within the study period and is discovered to be one of the causal factors of recessionary pressure in Nigeria within the study period of the study.

The regression coefficient of unemployment rate (UPR), is -0.58. It shows that a 1% increase in unemployment rate (UPR) will bring about 58% decreases in Gross Domestic Product (GDP). It is negative showing an inverse relationship between unemployment rate (UPR) and Gross Domestic Product (GDP) in Nigeria. Hence, unemployment rate (UPR) contributed to recessionary pressure since it has negative impact on GDP and is one of the causal factors of recessionary pressure in Nigeria within the study period.

The regression coefficient of interest rate (INTR), is -0.68. It shows that a 1% increase in interest rate (INTR) will bring about 68% decreases in Gross Domestic Product (GDP) in Nigeria. It is negative showing an inverse relationship between interest rate (INTR) and Gross Domestic Product (GDP). Hence, interest rate (INTR) contributed to recessionary pressure since it has negative impact on GDP within the study period and   is one of the causal factors of recessionary pressure in Nigeria..

The regression coefficient of tax rate (TAXR), is -0.69. It shows that a 1% increase in tax rate (TAXR) will bring about 69% decreases in Gross Domestic Product (GDP) in Nigeria. It is negative showing an inverse relationship between tax rate (TAXR) and Gross Domestic Product (GDP). Hence, tax rate (TAXR) contributed to recessionary pressure since it has negative impact on GDP in Nigeria and is one of the causal factors of recessionary pressure in Nigeria within the study period.

Furthermore, the result revealed based on the t-statistic value and probability value of inflation rate to be significant at 5% level of significance through the acceptance of the alternative hypothesis and rejection of the null hypothesis, and this implies that inflationary pressure is one of the causal factors of recessionary pressure in Nigeria. Hence, based on the t-statistic values and probability values, we can infer that macroeconomic variables such as exchange rate, unemployment rate, interest rate and tax rate contributed to recessionary pressure in Nigeria over the years.

The coefficient of determination is 0.989084. The estimated result shows that about 99% of the total variation in Gross Domestic Product is caused by the independent variables i.e. inflation rate (INF), exchange rate (EXR), unemployment rate (UPR) interest rate (INTR) and

tax rate (TAXR) while the remaining 1% are unexplained by the changes in other factors which are not included in the model but captured by the error term or stochastic variable. Since the R^2 is close to one, we can conclude that the model is a good fit and robust for forecasting or predicting future performance of the Nigerian economy using the regression model.

Also,. Since the D.W statistic = 2.474165, we can therefore conclude that there is no autocorrelation in the model since the D.W is approximately equal to 2.

ARIMA Model

Table 1: Examines the properties of the time series by carrying out unit root test for stationarity as a condition to adopt the **ARIMA** Model. If a variable is not stationary, **ARIMA** Model cannot be applied and vice versa. Hence, to ascertain the order of integration of the variables, this test is carried out to test for the presence of unit-roots (that is whether the variables are stationary or not) using the Augmented Dickey-Fuller *(ADF)* test.

Table 3.0: **Stationarity Test Result**

Variables	ADF	Critical values (5%)	Probability	order of integration
GDP (0)	-4.888	-2.986	0.000*	I
GDP (1)	-3.325	-2.968	0.023*	I

*indicates significance at five per-cents

Usually, the data must be stationary before we can identify a suitable ARIMA model.

Table 1 above revealed that GDP which is the dependent variable is stationary both at level and first difference.

ARIMA Model Identification

Having achieved stationarity, the next is to identify the model. This is established by finding suitable ARIMA form. This is achieved through Box-Jenkins procedure which involved plotting the correlogram and Partial correlogram of the stationary series. This is shown in figure 1 below;

Table 4.0: Correlogram and Partial Correlogram of the Difference of GDP (All item)

Date: 11/02/17   Time: 22:10

Sample: 1986 2016

Included observations: 31

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*******	. |*******	1	0.940	0.940	30.144	0.000
. |******|	.**| . |	2	0.853	-0.271	55.784	0.000
. |***** |	. *| . |	3	0.751	-0.119	76.404	0.000
. |***** |	. *| . |	4	0.644	-0.075	92.117	0.000
. |**** |	.**| . |	5	0.515	-0.252	102.55	0.000
. |*** |	. | . |	6	0.389	0.020	108.74	0.000
. |**. |	. | . |	7	0.271	-0.013	111.88	0.000
. |* . |	. |* . |	8	0.177	0.099	113.28	0.000
. |* . |	. *| . |	9	0.081	-0.149	113.58	0.000
. | . |	. | . |	10	-0.002	0.001	113.58	0.000
. *| . |	. *| . |	11	-0.078	-0.077	113.90	0.000
. *| . |	. | . |	12	-0.142	-0.056	114.98	0.000
. *| . |	. | . |	13	-0.197	0.013	117.19	0.000
.**| . |	. | . |	14	-0.241	-0.042	120.70	0.000
.**| . |	. | . |	15	-0.278	-0.009	125.65	0.000
.**| . |	. *| . |	16	-0.310	-0.106	132.22	0.000

As shown in figure1 above, all lags 1 and 16 are statistically significantly different from zero. They are outside the 95 percent confidence bounds. This depicts a correlogram of a random walk, hence, there is need to look for **ARIMA** model.

Table 5.0: Model Identification of GDP using Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF)

ARIMA	ACF and PACF(Number of lags)
GDP (All item) (1986-2016)	1,16

Source: Author's Computation using Eviews 9.5

Table 2 above shows different lags of ACF and PACF that are correlated. This revealed that the model follows an AR process. Thus, the model is estimated with AR and MA terms taking cognizance of the properties of the residuals. The best model is identified through this process.

The benchmark model used is the best-fitted ARIMA model for GDP. Preliminary analysis showed that the best model was an AR (1) and MA (1) model. We therefore estimate an AR (1) and MA (1) model as the base model.

MODEL SIMULATION

This is performed over the estimation of a model. The main reason for this simulation is model validation and evaluation. A comparison of the actual with the simulated series for the same variable is often used to test the validity of a model. This is because such a comparison allows an analyst or policy maker to determine how well a simulated series tracks the actual data. Measures used to test how closely a simulated series tracks its actual data are; the Bias proportion, Variance proportion, Covariance proportion and Theil's inequality coefficient (U).

Table 6.0: ARIMA Model Diagnostics

Diagnostics	GDP(All items)
R^2	0.98
Adj. R^2	0.97
Jarque-Bera	1.75
Probability	0.32
Theil Inequality	0.13
Bias proportion	0.00
Variance Proprtion	0.03
Cov. Proportion	0.96
LM test	0.28
ARCH	4.56

Source: Author's Computation using Eviews 9.5

Table 3 above shows diagnostics of the model and revealed that there is no serial correlation, the variance is constant, the residual is normally distributed.

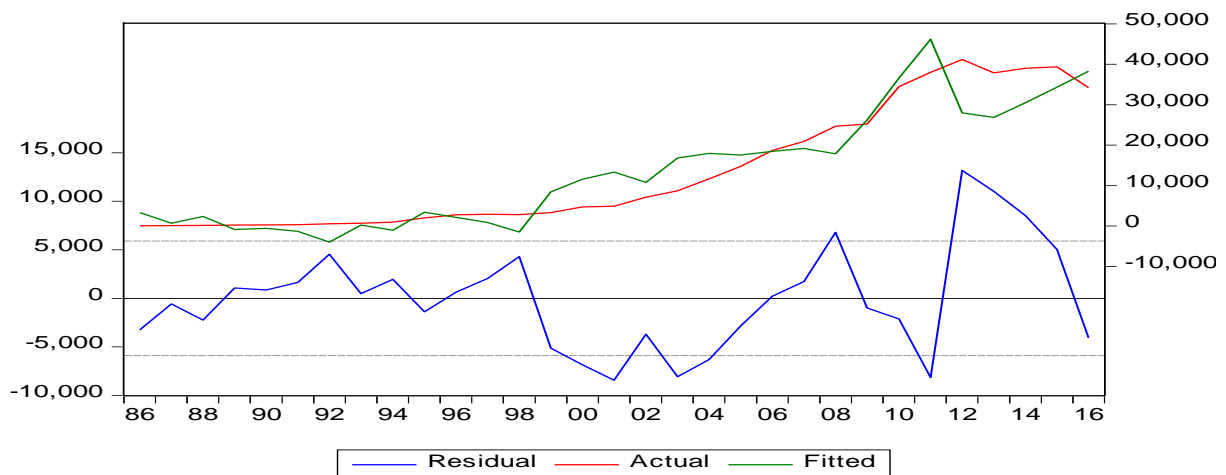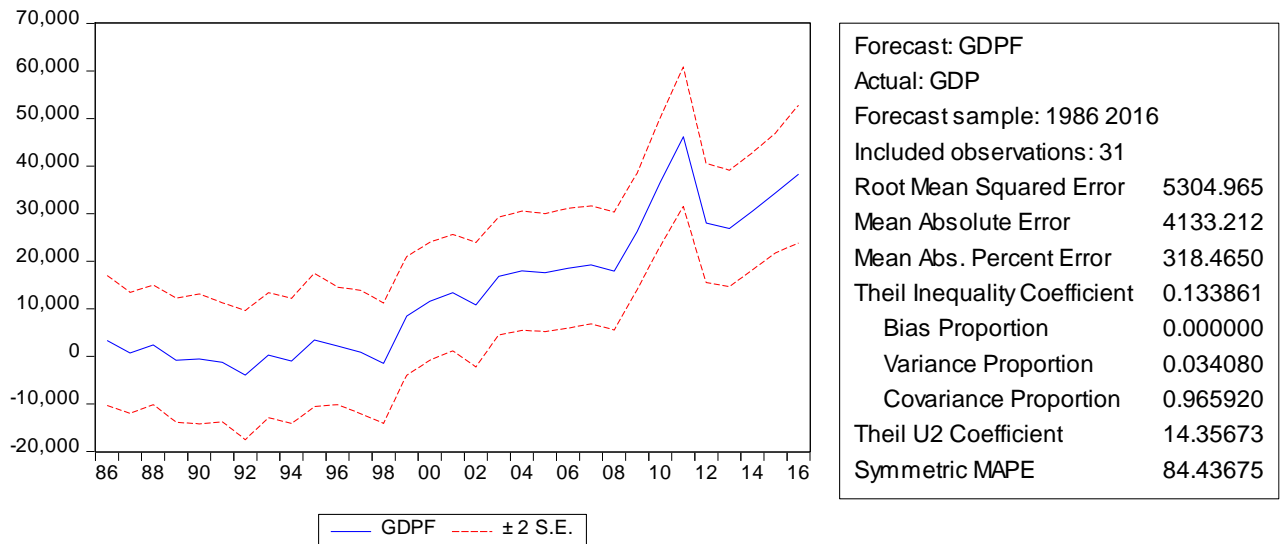**FIGURE 1.0: RESIDUAL, ACTUAL AND FITTED GRAPH OF GDP (ALL ITEMS)**

Figure 1.0 above presents the graph of the residual, actual and fitted values of the model. The fitted track the actual series very well. The residual is minimized

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HISTORICAL SIMULATION OF THE ARIMA MODEL: SUMMARY STATISTICS

Fig 2.0

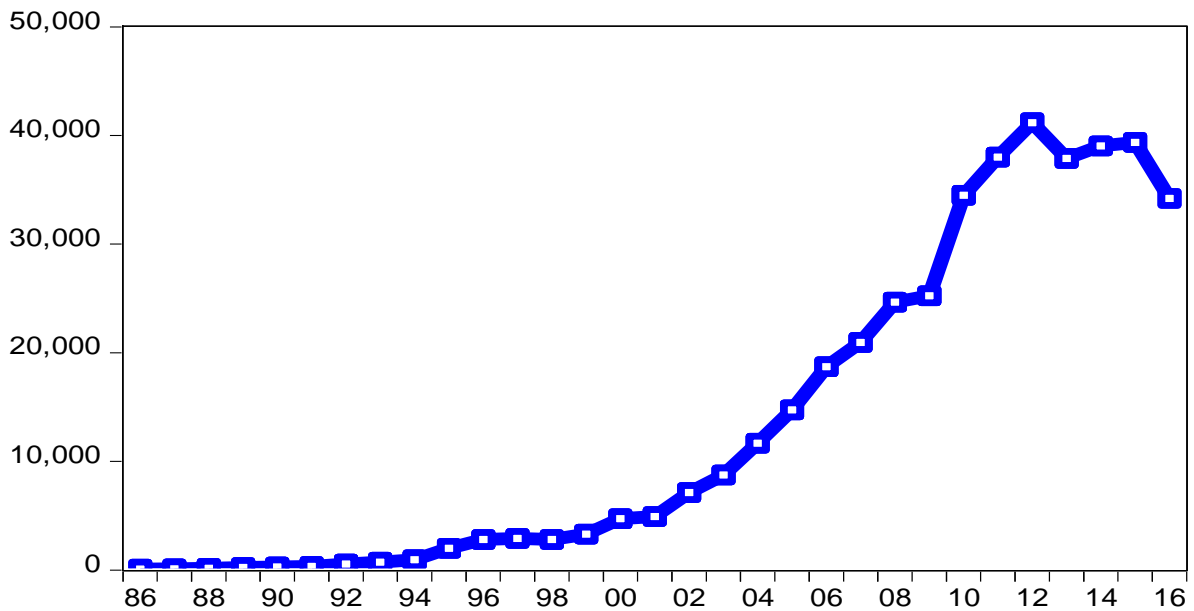| Forecast: GDPF	
Actual: GDP	
Forecast sample: 1986 2016	
Included observations: 31	
Root Mean Squared Error	5304.965
Mean Absolute Error	4133.212
Mean Abs. Percent Error	318.4650
Theil Inequality Coefficient	0.133861
Bias Proportion	0.000000
Variance Proportion	0.034080
Covariance Proportion	0.965920
Theil U2 Coefficient	14.35673
Symmetric MAPE	84.43675

Assessing within- the-sample forecasting ability of ARIMA model as indicated in figure 3, shows that the forecasting series are closer to the actual series. From the results obtained, the Theil's inequality coefficient and its decomposition into Bias, Variance, and Covariance proposition are seen to be very good. This shows that the model replicates the real life situations and can be used by policy makers for out-of -sample forecasting.

GRAPHICAL EVIDENCE OF RECESSIONARY PRESSURE IN NIGERIA

Fig 3.0

FALL IN GDP FOR TWO CONSECUTIVE QUATERS IN NIGERIA AS EVIDENCE OF RECESSIONARY PRESSURE

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From fig 3.0 above, we can deduce that between 2015 to 2016, the Nigerian economy experienced economic recession due to the incessant fall in the amount of Gross Domestic Product (GDP) in the economy.

CONCLUSION

The study adopted the Coharane Orcutt iterative method to correct the presence of autocorrelation in the model employed in the study. It also examined the relative predictive power of ARIMA Model in forecasting recessionary pressure in Nigeria using GDP as proxy in Nigeria. In achieving this, GDP was lumped into headline (All Item) rather than decomposing GDP. The Coharane Orcutt iterative method (Generalized Least Squares) shows that increased inflation rate (INF), exchange rate (EXR), unemployment rate (UPR) interest rate (INTR) and tax rate (TAXR) led to recessionary pressure in Nigeria as a result of fall in Gross Domestic Product. In the case of ARIMA, the result shows that it is a good predicator of recessionary pressure through GDP in Nigeria and serves as a benchmark model in GDP forecasting. Finally, we can conclude that a fall in Gross Domestic Product for two consecutive quarters in an economy is an evidence of economic recession.

RECOMMENDATION

Based on the result of the findings, the following recommendations were made

i.   There is need for Nigeria government to formulate policies to ensure relative price stability so as to enhance Gross Domestic Product towards reducing recessionary pressure in the Nigerian economy.

ii. Government should devalue the naira in order to achieve the desired level of economic growth through Gross Domestic Product so as to reduce the occurrence of recessionary pressure in the Nigerian economy.

iii. Government and relevant agencies in Nigeria should formulate policies to encourage self-employment and reduce cost of doing business in the country so as to achieve a high, rapid and sustained economic growth in order to avoid economic recession in future.

iv. The monetary authorities should also embark on routine efforts at bridging the widened gap between lending and savings rates as forms of interest rates to foster a moderate rise in nominal rates and stabilize recessionary pressure. This encourages savings and generates needed loanable funds for investment towards alleviating recessionary pressure in Nigeria.

v.   Given the high level of economic pain, policymakers need to pursue stimulus policies that work. Keynesians School has suggested measure of ending economic recession. The major measure is to reduce tax rate and increase aggregate demand. Government should reduce tax rates on individuals, small businesses, and corporations by lowering the tax rate by at least 10 % points.

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vi. Finally, mere increase in government spending will not solve the problem of recession. It is strategic spending in area with high multiplier effect such as agriculture and manufacturing sector that increase aggregate demand. Nigeria needs to expand her export earnings and production base through wise investment. Otherwise might likely end up in a classical Malthusian situation, where the resources cannot support the population. Injecting more funds into the economy is not bad, but there is need for diversification, allowing free flow of Naira and stabilizing the oil sector, modernizing agricultural sector as the way out of recession.

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