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Research Paper

Impact of Consumer Price Index on Nigeria Economic Growth: via VAR approach (2010-2020)

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This study analyzed the impact of consumer price index on Nigeria economic growth. vector error correction model (VECM) model was employed to allow each variable in the model as endogenous variable. The scope of the study was from 2010 to 2018 and the results revealed from VECM probability value, there is short run relationship between GDP as dependent variable with CPI. However, C(2) with p/value of (0.3391) shows that CPI does not have a long run causal effect on GDP at 5% of significant. Also, the second equation of VECM probability value, the result shows that, there is short run relationship between CPI as dependent variable with GDP. However, C(8) with p/value of (0.7303) shows that GDP does not have a long run causal effect on GDP at 5% of significant.

Furthermore, the long run coefficient of error correction mechanism further justified the behavior of variables in each model with their coefficient of error correction mechanism which were C(1) -0.000525 and C(7)* -0.739961 which shows that the variables will converge at the long run. However, the probability value of C(1)* was significant at 5% while C(7)* was not significant at 5%. Therefore, government should embark on the policies that will increase aggregate output in the country of which its multiplier effects will reduce the rate of unemployment, decrease in poverty level and above all, inflation rate will normalize if aggregate output increases.*

Keywords: *Economic growth, consumer price index and Vector Error Correction model.*

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I. INTRODUCTION

All economic agents, material and human resources in an economy involved in economic activities make effort to produce physical products and services that culminate into productive value that enhance earnings and income for individuals, households, firms and government at all levels. The income generated therefore is the value of the total product and services of all economic agents represented by gross domestic product (GDP).

Hence, GDP measures the value of goods and services produced in a country within a specific period of time, usually quarterly or annually. Despite criticism that GDP does not capture human welfare and the assumption that it does not consider externalities, yet it still remains a viable economic tool in determining period of boom and recession. For instance, the National Bureau of Statistics and monetary authorities represented by the Central Bank of Nigeria (CBN) agrees that the economy is in recession whenever GDP declines in two consecutive quarters. Even though the CBN describes its policy actions in terms of discretionary owing to several factors accounted for during several meetings of the Monetary Policy Committee (Ayinde, Bankole and Adeniyi, 2020), it is still economically and econometrically correct to make use of GDP in understanding and forecasting economic growth of Nigeria.

Research topics capable of understanding and forecasting key economic growth and development factor such as GDP is not just a want, but a necessity especially as the economy of Nigeria is still trying to rebound out of recession to growth. Today, forecasting a future courseof action calls for key macroeconomic variables such as Gross Domestic Product (GDP) to effectively adjustpolicies that would, in turn positively impact other macroeconomic variables such as inflation, job creation, exchange rate etc. Forecasts are used to

support politicians and decision makers who need information in orderto set the right policies. Monetary authorities needinformation about a future path ofinflation in order to adjust its interestrate,and companies forecast future sales in order to adjust their production.Even thoughforecasting clearly has an important purpose to fill withina large public policy making, it has not really gained the attention of so many researchers in this part of the world, especially the forecast of GDP.

Statement of the Problem

In this age of econometric tools and awareness globally, monetary authorities of developed and developing countries make decisions based on price and output development. Thus, taking decisions about the monetary policy rate without an estimate of the output gap is tantamount to 'flying blindly' and making very costly errors and revisions that are uncertain. Several benefits can be derived from making accurate forecasts which is not limited to making timely, effective and efficient policies toward economic growth and development.

In the literature, several methods such as the static component, dynamic component and or both have been applied to forecast economic activity. Some other empirical evidences have also attempts to understand and forecast growth for Nigeria, albeit linear frameworks were used to model a real life economy where we know in real sense there is no linearity. A number of these techniques are fraught with some challenges: first, they could lead to large forecasting errors; second, such forecasts could mislead economic agents who act based on decisions made by monetary and fiscal authorities.

It is surprising why the economy of Nigeria has been summersaulting and plunging into economic recession since 2015 to 2020. The logical questions and enquiry remains whether or not there is macroeconomic forecast at all? Or whether past economic forecasts anticipate possible economic recession to have efficiently make policy room to prevent its occurrence? Since 2016 and 2020 economic recession in Nigeria, some scholars have attributed economic downturn to international oil price, decline in crude oil production, activities of Niger-Delta militants and mostly advent of corona virus popularly called Covid-19.

It is true that the acclaimed attributing factors contributed to the said economic recession, however, if at all economic tools are deployed so frequently to understand the dynamics of the Nigerian economy and relevant forecasts are made, such doom would have been anticipated and appropriate policies would have been made to prevent sharp decline in GDP that plunged the economy into repeated economic recession in less than a decade. This is the research problem this works aims to address. Thus, the study reviewed literature on the subject matter, gathered, analyzed data to study the GDP level over time and made economic forecast.

Significance of the Study

According to Omotosho (2019), the contribution of oil to government revenue has remained quite high, increasing from 70.2 per cent during the 1980s to about 80.0 per cent in the last decade. In terms of trade, oil accounts for about 93.1 per cent of exports and 24.4 per cent of imports during the period 2010-2018. In a country like Nigeria where economic diversification is still work in progress with resultant effect in oil being a main contributor to the GDP, the importance of studies such as understanding and forecasting gross domestic product level in Nigeria cannot be over emphasized to further pursue economic diversification.

The central bank of many countries and other international actors provide forecasts of a large set of variables, however not much theoretical research is done regarding the choices of models, accuracy or other issues related to GDP forecasting (Pilström and Pohl, 2009).Thus, this research work make use of the vector autoregressive (VAR) model and like many other economic variables, GDP growth level and rates typically fluctuate around a higher level and are more persistent during expansions, but they stay at a relatively lower level and less persistent during contractions. Therefore, following this background this research is unique as it make use of most recent GDP data from 2010 to 2020q4 to understand and forecast probabilities of transiting from one economic state to another using suitable vector autoregressive (VAR) model. This uniqueness also carefully relate to its timeliness in helping to address economic short run and long run effect of one variable on the others.

Objectives of the Study

In line with the statement of the problem, the research main objective is to analyze and forecast impact of CPI on Nigeria economic growth. while the specific objectives of the study are to:

i. To analyze the short run impact of CPI on Nigeria economic growth (GDP).
ii. To forecast the longrun impact of CPI on Nigeria economic growth (GDP).

Research Hypotheses

The hypotheses that were used to guide this work are stated in null form as follows:

H_o: There is no short run significant impact of CPI on Nigeria economic growth (GDP).

H_o: There is no long run significant impact of CPI on Nigeria economic growth (GDP).

II. LITERATURE REVIEW

Conceptual Review

The Nigeria economy and of course the world have witnessed sharp swings during the 1982, 1994, 2008, 2016 and 2020 global economic crises periods. The inescapabilty of each of these domestic anduniversal economic challenge has implications on the ability to measure effectively potential and actual national productivity. Hence, a forecasting framework is needed to effectively address the challenge of understanding the current state of economic activity for policy decisions.

Macroeconomics is an empirical course, meaning that it is verifiable by observation or experience rather than theory. Given this, the first step toward understanding macroeconomic phenomenon is to measure the economy through gross domestic product (GDP), which remains a key variable that affect and in turn depend on so many other variables and therefore require consistent analysis and forecasting.The size of a nation's overall economy is typically measured by its GDP , which involves summing the production of different commodities and services such as houses, cars, fruits, computers, steel, banking and insurances and all other new goods and services produced in the current year to arrive at a total currency (naira) value using market prices.

When an economist talks about the size of an economy, it most likely refers to GDP. Therefore, Makinde, Adepetun and Oseni (2020) viewed GDP as an internationally accepted measure of economy size and strength. Measuring GDP tells us an enormous amount about how a nation is doing. If the GDP is rising, it signifies that incomes are rising, and consumers are purchasing more and all of this means a stronger and bigger economic activities.According to Khamis, Razak and Abdullah (2018), GDP growth rate measures the percentage change in gross domestic product from the previous periodssuch as monthly, quarterly or annually.

Theoretical Review

Endogenous Growth Theory

The endogenous growth theory was developed as a reaction to criticisms in the Solow- Swan neoclassical growth model. It is a new theory which explains the long-run growth rate of an economy on the basis of endogenous factors as against exogenous factors of the neoclassical growth theory (Chand, n.d). The Solow- Swan neoclassical growth model explains the long-run growth rate of output based on two exogenous variables: the rate of population growth and the rate of technological progress and that is independent of the saving rate. As the long-run growth rate depended on exogenous factors, the neoclassical theory had few policy implications. The new growth theory does not simply criticise the neoclassical growth theory. Rather, it extends the latter by introducing endogenous technical progress in growth models. The endogenous growth models have been developed by Arrow, Romer and Lucas, among other economists. We briefly study their main features, criticisms and policy implications. The Endogenous Growth Theory states that economic growth is generated internally in the economy, i.e., through endogenous forces, and not through exogenous ones. The theory contrasts with the neoclassical growth model, which claims that external factors such as technological progress, etc. are the main sources of economic growth. Key Policy Implications of Endogenous Growth TheoryGovernmental policies can raise an economy's growth rate if the policies are directed toward enforcing more market competition and helping stimulate innovation in products and processes.There are increasing returns to scale from capital investment in the "knowledge industries" of education, health, and telecommunications.Private sector investment in R&D is a vital source of technological progress for the economy.

MODERN QUANTITY THEORIES OF MONEY

A well-known economist, Irving Fisher (1867-1947) wrote in his book titled: The Purchasing Power of Money (revised edn. 1911).

The equation of exchange was given as follows:

M.V = P.T

Where:

M = stock of money in coin, notes, bank deposits ('high-powered')

V = the velocity of circulation of money.

P =price level of goods and services in the country; e.g. Consumer Price Index

T = total volume of trade that take place in the economy during the course of that same year in monetary term.

From the equation above, it simply means that, the total spending in the country is amount to total money stock multiplied by the rate of its turnover which is the velocity of money and is equals to total spending in terms of the total volume of monetary transactions multiplied by the current price index.

Empirical Review

So many factors account for observing conflicting results in the empirical literature. Studies by different scholars differ in economic variables selection, methodology, approach and estimations technique used. While

some empirical studies are based on cross-country analysis, others examined individual economy and even one or more sectors of an economy. This study therefore seeks to review evidences from researcher to see a point of divergence or convergence in research findings.

Adaramola and Dada (2020) examined the influence of inflation on the growth on Nigerian economy, the study employs the autoregressive distributed lag on the selected variables, i.e. real gross domestic product (GDP), inflation rate, interest rate, exchange rate, degree of economy`s openness, money supply, and government consumption expenditures for the period 1980–2018. The study findings indicate that inflation and real exchange rate exert a significant negative impact on economic growth, while interest rate and money supply indicate a positive and significant impact on economic growth. Other variables in the model depict no influence on the economic growth of Nigeria.

Etale and Eze (2019), examined the impact of some selected macroeconomic variables on stock market performance in the Nigerian Stock Exchange (NSE). The study adopted all share index (ASI) as proxy for stock market performance and the dependent variable, while the selected macroeconomic variables included broad money supply (BMS), interest rate (ITR), inflation rate (IFR), and exchange rate (EXR) used as the independent variables. Secondary data for the variables was sourced from Central Bank of Nigeria (CBN) Statistical Bulletins covering the period 1985 to 2017. The study employed multiple regression technique, Augmented Dickey-Fuller unit root test, Johansen co-integration test and Error Correction. However, Model (ECM) was used to analyzed the long-run equilibrium and short-run dynamic relationships existed between the selected macroeconomic variables and stock market performance in the Nigerian Stock Exchange. Based on the findings, the study recommended the monetary authorities should put in place sound monetary policies that would bring about positive developments in the stock market.

Izuchukwu and Patricia (2015)The main purpose of this study is to ascertain the existence of a relationship between inflation and economic growth in Nigeria. The methodology employed is the quantitative research design. Consumer price index (CPI) was used as a proxy for inflation and the GDP as proxy for economic growth, to examine the relationship. The scope of the study spanned from 2000 to 2009. Ordinary least square method and t-test was used to test the variables most likely to impact on economic growth in Nigeria due to inflation. The findings also shows that there is strong relationship between inflation and economic growth in Nigeria, that exchange rate has positive impact on economic growth and that high interest rate discourages investment and hence forestalls economic growth.

Doguwa (2012) examined the issue of the existence and the level of inflation threshold in the relationship between inflation and growth in Nigeria, using three different approaches that provide appropriate procedures for estimating the threshold level and inference. These results suggest that the threshold level of inflation above which inflation is inimical to growth is estimated at 10.5 to 12 per cent for Nigeria. Using the estimated two threshold point model, this paper did not find enough reasons to accept the null hypothesis of the super-neutrality of money, and therefore, suggest that there is a threshold level of inflation above which money is not super-neutral.

Theoretical Framework

MODERN QUANTITY THEORIES OF MONEY

A well-known economist, Irving Fisher (1867-1947) wrote in his book titled: The Purchasing Power of Money (revised edn. 1911).

The equation of exchange was given as follows:

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P =price level of goods and services in the country; e.g. Consumer Price Index

T = total volume of trade that take place in the economy during the course of that same year in monetary term.

From the equation above, it simply means that, the total spending in the country is amount to total money stock multiplied by the rate of its turnover which is the velocity of money and is equals to total spending in terms of the total volume of monetary transactions multiplied by the current price index. However, any increase in stock

of money without a corresponding increase in transactions output would cause the prices of goods and services to go up.

III. METHODOLOGY

A model is adapted fromIzuchukwu and Patricia (2015), this model is adapted because vector error correction model (VECM) model allows each variable in the model as endogenous variable, which could impact on itself and every other without the need to impose a theoretical structure on the estimates. Also, the model will affords the study opportunity to carry out variance decomposition (VDCs) in order to estimate the future impact of the variables.

$GDP_t = a_1 + \sum_{i=1}^{k} b_1 GDP_{t-1} + \sum_{i=1}^{k} d_1 CPI_{t-1} + U_{t1}$.....(1)

$CPI_t = a_2 + \sum_{i=1}^{k} b_2 CPI_{t-1} + \sum_{i=1}^{k} d_2 GDP_{t-1} + U_{t2}$.....(2)

VECTOR ERROR CORRECTION MODEL (VECM)

$\Delta GDP = a_0 + \sum_{i=1}^{a}(\partial_0 \Delta GDP_{t-1}) + \sum_{i=0}^{b} \partial_1 \Delta CPI_{t-1} + \mu VECM_t$.....(4)

$\Delta CPI = a_0 + \sum_{i=1}^{a}(\partial_0 \Delta CPI_{t-1}) + \sum_{i=0}^{b} \partial_1 \Delta GDP_{t-1} + \mu VECM_t$.....(5)

Where:

GDP = Gross Domestic Product

CPI= Consumer price index

From the equations above, the parameters to be estimated are bij, and dij, while the k measures the maximum lag length.

IV. RESULTS ANALYSIS

Table 4.1 UNIT ROOT TEST (Augmented Dickey Fuller Test)

Variable	First differences	Critical Values		Order of Integration	
GDP	-21.8632	1%	-4.21187	I(1)	**Stationary at 1st difference**
		5%	-3.52976		
		10%	-3.19641		
CPI	-6.58397	1%	-4.2050	I(1)	**Stationary at1st difference**
		5%	-3.52661		
		10%	-3.19461		

Source: Author's own computation using E-Views Software, Version 9.0

Table 4.1 present the result of the unit root test using Augmented Dickey Fuller Test, the variables are all stationary at first difference as the critical value are significant at 1%, 5% and 10% level of significance respectively. This showed that the variables are integrated of order one.

Cointegration Result
Trend assumption: Quadratic deterministic trend
Series: GDP CPI
Lags interval (in first differences): 1 to 4

Table 4.2: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.571331	37.25354	18.39771	0.0000
At most 1	0.039132	1.676585	3.841466	0.1954

From the result of trace statistic, the none* was rejected since trace statistic is greater than critical value at 5% with p/value lesser than 0.05, it shows that there is long run relationship with variables in the model

Table 4.3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

None *	0.571331	35.57695	17.14769	0.0000
At most 1	0.039132	1.676585	3.841466	0.1954

From the result of Max-Eigen, it was also observed that the none* was rejected since Max-Eigen is greater than critical value at 5% with p/value lesser than 0.05, it shows that there is long run relationship with variables in the model. i.e, the variables are cointegrated and having long- run equilibrium relationship.

Table 4.4: Vector Error Correction Estimates
Included observations: 32 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
GDP(-1)	1.000000
CPI(-1)	-125.2844 -7.59029 [-16.5059]
C	-9.290709

From the result of VECM value, the result shows that, there is short run relationship between GDP as dependent variable with CPI as deterministic variables. However, from the result, a unit change in CPI will cause an increase of 125.2844 in GDP all things being equal.

Probability Value of VCEM

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.739961	0.257811	-2.87017	0.0054
C(2)	0.202101	0.209965	0.962547	0.3391
C(3)	-0.319665	0.175436	-1.82212	0.0727
C(4)	-91.32959	144.4303	-0.63234	0.5292
C(5)	-97.41233	157.4162	-0.61882	0.5380
C(6)	1791.392	833.2509	2.149883	0.0350
C(7)	-0.000525	0.000361	-1.45528	0.1501
C(8)	0.000102	0.000294	0.346074	0.7303
C(9)	0.000488	0.000246	1.986957	0.0508
C(10)	0.719193	0.202261	3.555768	0.0007
C(11)	-0.033814	0.220447	-0.15339	0.8785
C(12)	1.753908	1.166890	1.503062	0.1373

Considering equation1 of VECM probability value, the result shows that, there is short run relationship between GDP as dependent variable with CPI. C(2) with p/value of (0.3391) shows that CPI does not have a long run causal effect on GDP at 5% of significant.

From equation 2 of VECM probability value, the result shows that, there is short run relationship between CPI as dependent variable with GDP. However, C(8) with p/value of (0.7303) shows that GDP does not have a long run causal effect on GDP at 5% of significant.

Furthermore, the long run coefficient of error correction mechanism further justified the behavior of variables in each model with their coefficient of error correction mechanism which were C(1)* -0.000525 and C(7)* -0.739961shows that the variables will converge at the long run. However, the probability value of C(1)* was significant at 5% while C(7)* was not significant at 5%.

V. Conclusion

The result of this study revealed the true economy situation of Nigeria as a country, the increase in consumer price index causes increase in the aggregate output in the country which increase in GDP without

corresponding positive effect measured in the life of the people. Therefore, the positive relationship between GDP and CPI is not justify with the rate of poverty level in the country coupled with high rate of unemployment. i.e, the increase in GDP as a result of increase in CPI does not have a positive impact in the life of an average Nigerians. The fisher equation was in line with the results obtained which says that, any increase in money supply without corresponding increase leads to increase in price of goods and services in the country. Therefore, government should embark on the policies that will increase aggregate output in the country of which its multiplier effects will reduce the rate of unemployment, decrease in poverty level and above all, inflation rate will normalize if aggregate output increases.

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