The Impact of Macroeconomic Factors on Economic Growth of Nigeria: A Vector Error Correction Model (VECM) Approach

Agbarakwe, Wilson Chimezie

Department of Business Administration Covenant Polytechnic, Aba, PMB 7065, Aba

Abstract: *This research is set out to examine the impact of key macroeconomic variables on Nigeria`s economic growth for the period 1980 to 2016. The selected macroeconomic variables are inflation rate (INF), Unemployment rate (UM) and interest rate (INT). The study is an attempt to evaluate how these key macroeconomic variables explain the growth of Nigerian economy. The scientific method adopted for this investigation is multiple regression analysis. However, the study carried out some diagnostic tests which include unit root test, cointegration analysis, vector error correction model (VECM) and granger causality test. The vector error correction model was employed to estimate both the short run and long run relationship between the regressor and the regressand. The result obtained indicate that there is a long run significant but negative relationship between gross domestic product and inflation. The study further reveal that the speed of adjustment from short run to long run is slow, specifically, it takes about 41 percent speed to adjust from previous year to a current year. The result equally show that there was bi-directional causality between gross domestic product and inflation but a uni-directional causality flows from GDP to interest rate. This therefore, implies that a good performance of the Nigerian economy in terms of growth may be achieved with lows rate of unemployment and interest rate in the country, hence a major policy implication is that concerted effort should be made to reduce unemployment and stabilize the prices of goods and services (inflation) so as to achieve high, rapid and sustained economic growth rate in Nigeria.*

Key words: *Economic growth, inflation. Unemployment, interest rate, cointegration*

Introduction

Inflation is a persistent and continuous rise in the general price stability. When inflation occurs in any country, it is difficult for money to satisfy or perform its functions (that is as a medium of exchange and a store of value). This has adverse effect on employment, income distribution, investment and economic growth. During inflation, corporate and non-corporate profits rise sharply and businessmen react to rising prices by buildup inventories. Inflation not only affects the income and expenditure pattern of major sectors of the economy, but it also alters the existing pattern of distribution of wealth, making some group better off, relative to others and also wipes out savings completely.

Unemployment is one of the most critical problems challenging macroeconomist especially Nigerians. It is defined as a situation where able-bodied men and women who are willing ready and capable of working but could not find jobs. Unemployment has been categorized as one of the stand impediment to social progress. Apart from representing a colossal waste of a country`s manpower resources, it results in welfare loss in terms of lower output, thereby leading to lower income and standard of living.

The importance of interest rate as a policy instrument lies in the fact that it can be used judiciously to foster meaningful economic growth. This is due to the effect, it has on savings, investment, output growth, employment, money supply and balance of payment. As a return for financial assets, interest rate serve as incentives to savers and by extension influences availability of savings. The primary role of interest rate is to help in the mobilization of financial resources and to ensure efficient utilization of such resource in the promotion of economic growth. Interest rate affects the level and pattern of investment on the other hand. It is crucial in financial institution/intermediation which involves transferring funds from surplus saving units in an economy to the deficit saving units. In general, interest rates are useful in financial market condition and it is a major tool of monetary policy.

Statement of the Problem

The Nigerian economy has remained underdeveloped for a long period despite being richly blessed with huge human and natural resources. This has been attributed to various factors such as corruption, high interest rate, unemployment, inflation e.t.c. To some growth economists, persistent unemployment is a sign of market failure, because unemployment is a waste of scarce resources and lead to a loss of potential output and reduction in allocative efficiency. Unemployment and inflation are two twin evils that have eaten deep into the fabric of the Nigerian economy over the years. In other hand, the importance of interest rate as a policy instrument lies in the fact that it can be used judiciously to foster meaningful economic growth. This is due to the effect it has on savings, investment, output growth, employment, money supply and balance of payment. As a return for financial assets, interest rate serves as incentives to savers, and by extension influences availability of savings.

Over time, Nigeria government has continued to manipulate these macroeconomic variables with the intent to push the frontier of economic growth and development, but unfortunately the growth rate has been unimpressive. This raises a research questions on what has been the reasons for such anomaly. Besides, several revered scholars have carried out a similar study in Nigeria but their submission has been conflicting. For instance,

Patrick (2013) and Wiza (2014), submit that there exist negative relationship between inflation and economic growth whereas Umaru (2006) and Ismaila (2015) was of the opinion that inflation spur economic growth. This conflicting finding is a motivation for further researches in this area and the present researcher is motivated to fill these research gaps.

Objectives of the Study

The major objective of the study is to determine empirically the effects of unemployment, interest rate and inflation on economic growth in Nigeria. The specific objectives of this study are to:

i. Examine if there is significant long run equilibrium relationship between inflation and economic growth

ii. Estimate if there is significant long run equilibrium relationship between unemployment and economic growth

iii. Investigate if there is significant long run equilibrium relationship between interest rate and economic growth

iv. If there is any significant causal relationship between the identified macroeconomic variables and economic growth in Nigeria.

Research Questions

This study is aimed at finding answers to the following research questions

i. To what extent does inflation predict the growth of Nigerian economic growth?

ii. Is there any significant long run relationship between unemployment and economic growth in Nigeria?

iii. How have changes in interest rates significantly predicted the growth of Nigerian economy over time?

iv. What is the direction of causality among the identified macroeconomic variables and economic growth in Nigeria?

Research Hypotheses

For the proper analysis of this research work, the following hypotheses have been formulated to guide the study:

i. **Ho_1:** There is no significant long run relationship between inflation and economic growth

ii. **Ho_2:** There is no significant long run relationship between unemployment and economic growth

iii. **Ho_3:** There is no significant long run relationship between interest rate and economic growth.

v. **H_{04}** There is no significant causal relationship between the identified macroeconomic variables and the growth of Nigerian economy

REVIEW OF RELATED LITERATURE

Theoretical Literature

Natural Rate Hypothesis

The natural rate of unemployment theory, also known as the non-accelerating inflation rate of unemployment (NAIRU) theory, was developed by economists Milton Friedman and

Edmund Phelps. According to NAIRU theory, expansionary economic policies will create only temporary decreases in unemployment as the economy will adjust to the natural rate. Moreover, when unemployment is below the natural rate, inflation will accelerate. When unemployment is above the natural rate, inflation will decelerate. When the unemployment rate is equal to the natural rate, inflation is stable, or non-accelerating.

Classical growth theory:

Adam Smith who pointed a supply side driven model of growth laid the Classical growth model. He viewed saving as a creator of investment and hence growth. Therefore, he saw income distribution as being one of the most important determinants of how fast (or slow) a nation would grow. He also posited that profits decline – not because of decreasing marginal productivity, but rather because the competition of capitalists for workers will bid wages up. The link between the change in price levels (inflation) and its effects on profit levels and output were not specifically articulated in classical growth theories. However, the relationship between the two variables is implicitly suggested to be negative, as the reduction in firms' profit levels through higher wage costs. Put simply, according to classical explanation inflation affects economic growth negatively (Gokal & Hanif, 2004).

Keynesian growth theory:

In the framework of Keynesianism, the aggregate demand (AD) and aggregate supply (AS) curves are adopted to show the relationship between output and inflation. According to Keynesian, in the short run, the AS curve is upward sloping rather than vertical. If the AS curve is vertical, changes on the demand side of the economy affect only prices. However, if it is upward sloping, changes in AD affect both price and output. This holds with the fact that many factors, such as expectations, prices of other factors of production, fiscal and monetary policy, drive the inflation rate and the level of output in the short -run. When the general prices increase Producers of a certain product feel that only the prices of their products have increased while the other producers are operating at the same price level. However, in reality overall prices have risen. Thus, the producer continues to produce more and output continues to rise. It reveals that according to Keynesian there exists a positive effect of price increase on output at least in the short-run (Snow don, 2005).

Money & Monetarism Theory

Monetarism has several essential features, with its focus on the long-run supply-side properties of the economy as opposed to short-run dynamics. Milton Friedman, who coined the term "Monetarism", emphasised several key long-run properties of the economy, including the Quantity Theory of Money and the Neutrality of Money. The Quantity Theory of Money linked inflation and economic growth by simply equating the total amount of spending in the economy to the total amount of money in existence. Friedman proposed that inflation was the product of an increase in the supply or velocity of money at a rate greater than the rate of growth in the economy. Friedman also challenged the concept of the Phillips Curve. His argument was based on the premise of an economy where the cost of everything doubles. Individuals have to pay twice as much for goods and services, but they don't mind, because their wages are also twice as large. Individuals anticipate the rate of future inflation and incorporate its effects into their behaviour. As such, employment and

output is not affected. Economists call this concept the neutrality of money . Neutrality holds if the equilibrium values of real variables -including the level of GDP - are independent of the level of the money supply in the long-run. Superneutrality holds when real variables - including the rate of growth of GDP - are independent of the rate of growth in the money supply in the long-run. If inflation worked this way, then it would be harmless. In reality however, inflation does have real consequences for other macroeconomic variables. Through its impact on capital accumulation, investment and exports, inflation can adversely impact a country's growth rate. In summary, Monetarism suggests that in the long-run, prices are mainly affected by the growth rate in money, while having no real effect on growth. If the growth in the money supply is higher than the economic growth rate, inflation will result.

Neo-classical and endogenous growth theories:

Mundell (1963) & Tobin (1965), have explained the effect of inflation on economic growth based on neo-classical growth theory. They depict a positive relationship between inflation and economic growth by assuming that real money balance and investment are substitute. Thus when inflation is high, it will decrease the return on real money balances but the return on investment will increase and people substitute real money balance by investing on other assets. This increases capital accumulation and the economic growth and it will show positive relationship between inflation and economic growth. Contrary to the conclusion of the undell-Tobin effect, Stockman (1981) develops a long-run equilibrium growth model with assumption of "cash-in-advance constraint. In the model of Stockman (1981), the two variables relationship is complement, accounting for a negative relationship between the steady-state level of output and the inflation rate. Stockman models this cash investment as a cash-in-advance restriction on both consumption and capital purchases. Since inflation erodes the purchasing power of money balances, people reduce their purchases of both cash goods and capital when the inflation rate rises. Correspondingly, the steady-state level of output falls in response to an increase in the inflation rate. Also return to labor falls when the inflation rate rises. As such, people substitute away from consumption to leisure, because the return on labor falls and this in turn reduce economic growth

Empirical Review

Mohseni, M. (2016), takes into account a re-examination of the role of inflation and unemployment on economic growth using the ARDL regression model. The results showed long run negative effect of inflation and unemployment on economic growth. In the study of Semuel & Nurina(2015), examined the influence of inflation rate, rates of interest and exchange rates on gross domestic product in Indonesia based on monthly time series data between 2005 (June) and 2013 (December) using statistical techniques. The results demonstrated that there was a noteworthy negative association between interest rates and GDP as well as an important positive association between exchange rates and the GDP, whereas inflation was not a momentous persuade on GDP.

Yelwa, M. (2015), investigated the relationship between unemployment, inflation and economic growth in Nigeria. Utilizing secondary data with OLS regression method, their results confirmed that interest rate and total public expenditure bares significant impact on economic growth in the long run whereas on the contrary, inflation and unemployment has

inverse effects on growth in the Nigerian economy. They clarify further that this increase is likely due to interruptions in the supply chain of goods both from the domestic and foreign supply outlets other than the suspected aggregate demand pressure . The study concludes with a confirmative note on the existence of a causal linkage between inflation, unemployment and economic growth in the Nigeria n economy recommending among others the need for government to improve the macroeconomic policy instruments to the attainment of sustainable and enabling environment in order to propel domestic output

Shahid, M. (2014), studied on the impact of inflation and unemployment on the economic growth of Pakistan via the ARDL model approach found that a long run relationship between the variables existed. In the study of Umoru & Anyiwe (2013), examined the dynamics of inflation and unemployment over a period of twenty seven years and discovered that the relationship between inflation and unemployment is positive and there exist stagflation in the economy. Therefore, they suggested interest rate reduction and control of money supply to boost economic growth. In another empirical work,

Mahmoud A. J(2013), has analyzed impact of inflation and unemployment on Jordanian GDP from (2000-2010) and the results of the study indicate that there is a negative relation between unemployment and GDP, and there is a positive relation between Inflation and GDP. In the study of Muhammad Umair & Raza Ullah (2013), have analyzed the impact of GDP and inflation on unemployment rate of Pakistan Economy in (2000-2010) and their study concluded that inflation has a role which influential but for GDP and unemployment with insignificant levels in the macroeconomics factors of Pakistani economy.

Ayesha & Wajid (2013), empirically analyzed the impact of inflation and economic growth on unemployment by using time series evidence from (1973 – 2010) in Pakistan. This study used Augmented Dickey Fuller (1981) test to test unit root problem and in order to find out the long run relationship among unemployment, inflation, economic growth, trade openness and urban population he applied Johansen – Juselius (1990) Maximum Likelihood Approach. This study concludes that inflation significantly increases unemployment in the long term; economic growth has a significant adverse impact on unemployment in the long run and in the short run respectively, and the impact of trade openness on unemployment is positively and insignificant in the long run but this impact becomes significant in the short run.

Karaçor, Zeynep, (2013), have analyzed the causal relationship between unemployment, inflation and the minimum wage: Case of Turkey from (1987 to 2010). Their study has found that the level of minimum wages and inflation variables is Granger reason for the unemployment in short period. Another study carried out by Auwal A. M (2013), analyzed the effect of unemploy-ment and inflation on wages in Nigeria using Ordinary Least Square (OLS) method, Augmented Dickey - Fuller (ADF) technique and Granger causality test. The result of the regression revealed that the coefficient of unemployment is positive and statistically significant influence wage rate whereas inflation is positive but has no significant effect on it. Moreover, result of the unit root indicates that all the variables in the model are stationary while, the result of causality test suggests that unemployment Granger causes wage rate and not inflation.

Saymeh & Orabi(2013), observed the influence rate of interest, inflation rate and GDP on real economic growth in Jordan for the period from 2000 to 2010 using financial econometrics. Johansen cointegration test results confirmed that all the variables were

associated in the long-run. Moreover, regression test results illustrated that interest rate and inflation rates had a shock on economic growth rate

Aminu, Manu & Salihu (2013), investigated the effect of unemployment and inflation on economic growth in Nigeria. The study covers 1986-2010. They used OLS, Augmented Dickey-Fuller technique, Granger causality and Johansen cointegration technique and found that both unemployment and inflation impacted positively on the economic growth in Nigeria. The adoption of ordinary least squares reveals a positive correlation between the two proxies of government spending (services and capital spending) and economic growth. But when a two-stage least squares techniques were used, a positive relationship could not be established in most cases, especially in public capital.

Bakere (2012), conducted a study on stabilization policy, unemployment crises and economic growth in Nigeria. He used OLS and found that the nexus between inflation, unemployment and economic growth in Nigeria were negative. Rafindadi (2012), conducted a study on the relationship between output and unemployment dynamics in Nigeria; and used OLS and Threshold model. He found a negative nonlinear relationship between output and unemployment.

METHODOLOGY
Research Design
This study adopted Ex-post-facto research Design. This design type is relevant in explaining a consequence based on antecedent conditions, as well as determining the influence of one variable on another variable. Besides, Ex-post-facto research design is described as empirical inquiry in which the scientist does not have direct control of variables. Inferences about relationships among variables are made from any determined variations between the studied variables

The aim of the study was to determine the correlation among macroeconomic variables which include, economic growth (GDP) as the dependent variable and inflation (INF); Unemployment (UM); Interest rate (INT), as the independent variable.

Nigerian annual time series data spanning from 1980 to 2016 was employed to determine how these macroeconomic variables predict economic growth. The study covered the period
1980 – 2016, period of (36) years believed to be long enough to account for the long run relationship among the series under consideration in Nigeria.

The principal instrument used to estimate the specified model was the vector error correction model (VECM believed to be the most reliable for multivariate time series analysis (Igbatayo & Agbada, 2012). VECM was used to determine the short run and long run dynamics of the series in the model. Other methods adopted for the present study to ensure quality results include however, Augmented Dickey-Fuller unit root test procedure, to examine whether macroeconomic variables in the model are integrated of order one 1(1) or not. The Granger causality (GC) test followed and was used to establish whether or not there was any feedback effects among the variables considered.

Model Specification
The principal instrument adopted for this study was Vector error correction model (VECM). To determine if inflation, unemployment and interest rate predict economic growth in Nigeria within the sample period, the researcher specified the model below to

address the above stated objective. The model that will capture this relationship is specified below:

$$GDP_t = \beta_0 + \beta_1 INF_t + \beta_2 UM_t + \beta_3 INT_t + \varepsilon_{1t} \qquad (1)$$

Where;

GDP_t = economic growth rate

INF_t = inflation rate

UM_t = unemployment rate

INT_t = interest rate

$\beta_0 - \beta_3$ refers to the parameters to be estimated

ε_t = omitted variable

A priori expectation: $(\beta_0 - \beta_3 < 0)$

PRESENTATION OF RESULTS

Tests for stationarity

This study began by the presentation of the results. The result of the Augmented Dickey-Fuller Unit Root test showed that the whole series employed (economic growth (GDP), Inflation (INF), interest rate (INT), and Unemployment rate (UM) are non-stationary, ie I(1). This is because their respective ADF test-statistics exceeded the 5% critical value. In other words, the variables are not stationary at their level form and needed to be differenced to determine their respective order of integration. They were all confirmed to be stationary only after their first differencing. The result conducted at both 1% and 5% critical values is presented in table 4.1 below:

Table 4. 1: RESULT OF THE ADF UNIT ROOTS FOR STATIONARITY

	LEVELS			1st DIFFERENCE			
VARIABLES	ADF Statistic	1% Critical	5% Critical Value	ADF Statistic Value	1% Critical Value	5% Critical Value	REMARKS
GDP	-2.554300	-4.273277	-2.971853	-10.36608	-4296729	-3.568379	1(1)
INF	-2.541158	-3.626784	-2.945842	-9.768997	-4.296729	-3.568379	1(1)
INT	-1.173142	-3.626784	-2.945842	-12.14131	-4.296729	-3.568379	1(1)
UM	-0.454652	-3.626284	-2.945842	-9.215584	-4.296729	-3.568379	1(1)

Source: Author's compilation using E-View 9.5 computer software

As shown on table 4.1 above, the unit root tests result indicated that all the series namely; economic growth (GDP); Inflation (INF); Interest rate (INT) and unemployment (UM); contained unit root and are stationary only after first differencing, at 1% and 5% significant levels. This follows the decision rule which states that when the value of the computed ADF test statistics exceeds its critical value, the null hypothesis is rejected and the alternative accepted.

The stationarities of all the series in the same order was thus a motivation to run for co-integration tests. This is aimed at finding the presence or absent of any long run relationship among the series. This corroborates with the submission by Woodridge (2002) and Grene (1997) that when more than one variable is not stationary at levels,

there is every need to run a co-integration test in order to verify if the series have any long run equilibrium relationship.

In view of the above therefore, since the variables are stationary at difference orders, there was the need for a test for co- integration test using the Johansen (1991) co-integration technique. The result is presented in table 4.2 as shown below:

Table 4.12

Date: 11/19/17   Time: 19:32
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments
Trend assumption: Linear deterministic trend
Series: GDP INF INT UM
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.584036	51.45170	47.85613	0.0221
At most 1*	0.289892	20.75126	19.79707	0.0533
At most 2	0.219191	8.769431	15.49471	0.3872
At most 3	0.003126	0.109565	3.841466	0.7406

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4.13

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.667783	38.56879	32.11832	0.0071
At most 1*	0.329259	23.97802	15.82321	0.0324
At most 2	0.219661	8.680945	19.38704	0.7568
At most 3	0.112593	4.180802	12.51798	0.7158

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4.12 and Table 4.13 above indicated the presence of (1) co-integrating equation for trace statistics and 2 cointegrating equation for maximum eigenvalue at 5% level of significance. Co-integration exists at those ranks where the value of the trace statistic exceeds the 5% critical value.

Again, the eigenvalues all lie below 1, indicating the presence of co-integration. Having established the presence of co-integration, the researcher moved on to calculate the speed of adjustment of the model to shocks. To do this, the researcher computed the Vector Error Correction Model. The result is presented in Table 4.14 below:

Table 4.14: Result of Vector Error Correction Model Analysis

Vector Error Correction Estimates
Date: 11/19/17   Time: 22:02
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
GDP(-1)	1.000000
INF(-1)	-11.85405
	(3.97935)
	[-2.98315]
INT(-1)	-7.415021
	(2.22351)
	[-3.36024]
UM(-1)	-1.035200
	(0.99338)
	[-1.04232]
C	13.74451

Error Correction:	D(GDP)	D(INF)	D(INT)	D(UM)
CointEq1	-0.413881	-0.000785	0.000437	-0.000439
	(0.31417)	(0.00088)	(0.00018)	(0.00013)
	[-1.31737]	[-0.88967]	[2.49198]	[-3.35712]
D(GDP(-1))	0.239201	-0.001202	0.001186	-0.001037
	(0.20973)	(0.01306)	(0.00260)	(0.00193)
	[1.14050]	[-0.09202]	[0.45681]	[- 0.53595]
D(GDP(-2))	0.214830	-0.001530	-0.003409	-0.004131
	(0.41141)	(0.02562)	(0.00509)	(0.00379)
	[0.52218]	[-0.05971]	[-0.66912]	[-1.08872]
D(INF(-1))	-0.707705	0.197090	0.089721	0.100816
	(3.98803)	(0.24839)	(0.04938)	(0.03678)
	[-0.17746]	[0.79346]	[1.81679]	[2.74119]
D(INF(-2))	-1.118923	-0.222351	0.110532	0.041399
	(4.21761)	(0.26269)	(0.05223)	(0.03890)
	[-0.26530]	[-0.84643]	[2.11636]	[1.06436]
D(INT(-1))	-1.893013	1.545025	0.074187	0.019168
	(18.4774)	(1.15087)	(0.22881)	(0.17040)
	[-0.10245]	[1.34249]	[0.32423]	[0.11249]
D(INT(-2))	-7.901385	-1.034075	-0.070811	-8.63E-05
	(16.1532)	(1.00610)	(0.20003)	(0.14897)
	[-0.48915]	[-1.02780]	[-0.35401]	[-0.00058]
D(UM(-1))	-3.239905	0.556594	-0.068501	-0.189201
	(17.0619)	(1.06270)	(0.21128)	(0.15735)
	[-0.18989]	[0.52375]	[-0.32422]	[-1.20244]
D(UM(-2))	-1.694663	0.489502	0.035370	-0.052589
	(15.7112)	(0.97857)	(0.19455)	(0.14489)
	[-0.10786]	[0.50022]	[0.18180]	[-0.36296]
C	26.70562	1.179476	-0.042867	0.324192
	(59.9854)	(3.73619)	(0.74281)	(0.55320)
	[0.44520]	[0.31569]	[-0.05771]	[0.58603]

R-squared	0.632176	0.259202	0.339118	0.554349
Adj. R-squared	0.522577	0.388597	0.091287	0.387230
Sum sq. resids	95.99667	43.44505	242.8345	34.68260
S.E. equation	6.871887	15.99928	3.180896	2.368919
F-statistic	0.336932	0.933057	1.368346	3.317087
Log likelihood	-23.97433	-136.5892	-81.66624	-71.64544
Akaike AIC	14.17496	8.622893	5.392132	4.802673
Schwarz SC	14.62389	9.071822	5.841061	5.251602
Mean dependent	5.622059	0.008824	0.400000	0.611765
S.D. dependent	2.488693	15.85255	3.336847	3.026225

Determinant resid covariance (dof adj.)	6.96E+08
Determinant resid covariance	1.73E+08
Log likelihood	-5.427583
Akaike information criterion	32.90750
Schwarz criterion	34.88279

As shown in the upper region of the vector error correction model (VECM) for equation 1 above as well as the normalized cointegrating coefficients for two cointegrating equations given by the long run relationship as shown below: the long run relationship which Normalized cointegrating coefficients (standard error in parentheses)

GDP	INF	INT	UM
1.000000	- 11.854	- 7.4150	- 1.0352
	(3.979)	(2.223)	(0.9933)

relates economic growth as a function of inflation, interest rate and unemployment shows that co-integrating equation 1 is well behaved having possessed the expected negative signs, and significant at 0.05 level Also, the coefficients for VECM are -0.413881. This indicates that 41% of the imbalance between the short run and long run relationship is corrected annually. The R-squared value of 0.632176 indicates that about sixty three (63%) of the variability in economic growth in Nigeria within the period under review was determined or influenced by inflation, interest rate and unemployment.

As regards the expected signs, the link amid economic growth and inflation, interest rate and unemployment are negatively related with economic growth in the long run as can be seen in the upper region of the vector error correction model (VECM). In other hand, the relationship between economic growth and inflation, interest rate and unemployment, is also negative in the short run but insignificant.

The result of the system equation used to test the causality between economic growth and the selected macroeconomic variables as shown in table 4.15 below indicates that with the VECM coefficient of -0.413882, the implication is that 41% of the disequilibrium between the short run and long run relationship is corrected annually. Moreover, the VECM coefficient satisfies the required condition of being fractional, negative and significant considering the P-value of 0.0462 as shown in the system equation below. According to Gujarati, (2003), if it is not significant, it indicates that causality does not exist between all the explanatory variables and economic growth in Nigeria within the period under review. Thus, since the three conditions of being fraction, negative and significant are fully satisfied; the conclusion is that there is causal relationship between economic growth and the selected macroeconomic variables in Nigeria. Moreover, Granger causality tests were also conducted to find out which variable causes the other.

Table 4.15
System Equation

Dependent Variable: D(GDP)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 12/05/17   Time: 21:58
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments
D(GDP) = C(1)*(GDP(-1) + 311.854048795*INF(-1) - 1237.4150203*INT(
    -1) + 1223.03519869*UM(-1) - 4432.74450336) + C(2)*D(GDP(-1)) +
    C(3)*D(GDP(-2)) + C(4)*D(INF(-1)) + C(5)*D(INF(-2)) + C(6)*D(INT(-1))
    + C(7)*D(INT(-2)) + C(8)*D(UM(-1)) + C(9)*D(UM(-2)) + C(10)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.413882	0.314177	-1.317374	0.0462
C(2)	0.239201	0.209734	1.140496	0.2653
C(3)	0.214830	0.411411	0.522179	0.6063
C(4)	-0.707705	3.988027	-0.177457	0.8606
C(5)	-1.118923	4.217607	-0.265298	0.7930
C(6)	-1.893013	18.47742	-0.102450	0.9193
C(7)	7.901385	16.15322	0.489152	0.6292
C(8)	-3.239905	17.06195	-0.189891	0.8510
C(9)	-1.694663	15.71117	-0.107864	0.9150
C(10)	26.70562	59.98537	0.445202	0.6602

R-squared	0.611218	Mean dependent var		65.62206
Adjusted R-squared	0.522076	S.D. dependent var		2.488693
S.E. of regression	6.871887	Akaike info criterion		14.17496
Sum squared resid	95.99667	Schwarz criterion		14.62389
Log likelihood	-230.9743	Hannan-Quinn criter.		14.32806
F-statistic	0.336932	Durbin-Watson stat		2.048674
Prob(F-statistic)	0.953371			

Table 4.16   GRANGER CAUSALITY TESTS RESULT FOR GDP

Pairwise Granger Causality Tests
Date: 12/31/17   Time: 13:36
Sample: 1980 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INF does not Granger Cause GDP	35	3.38837	0.0468
GDP does not Granger Cause INF		3.23856	0.0504
INT does not Granger Cause GDP	35	0.60077	0.5549
GDP does not Granger Cause INT		3.50115	0.0411
UNEMP does not Granger Cause GDP	35	2.28081	0.1196
GDP does not Granger Cause UNEMP		2.97965	0.0660
INT does not Granger Cause INF	35	3.11843	0.0568
INF does not Granger Cause INT		1.80090	0.1825
UNEMP does not Granger Cause INF	35	0.56971	0.5717
INF does not Granger Cause UNEMP		0.85236	0.4365
UNEMP does not Granger Cause INT	35	1.08318	0.3514
INT does not Granger Cause UNEMP		3.28309	0.0514

As also indicated by the Granger causality test, bilateral or reverse causation exist between economic growth and inflation as shown above. This is because the F-value of 3.38837 and 3.23856, with their corresponding low P-values of 0.0468 and 0.0504 respectively are both significant for null hypotheses. However, the granger causality tests confirmed that a uni-directional causality runs from economic growth to interest rate.

Evaluation of Working Hypotheses

Hypothesis 1: Inflation do not have any long run significant impact on economic growth in Nigeria within the period under investigation.

This hypothesis was evaluated with the vector error correction model technique. Based on the result of the Vector error correction model as attached, with the t-statistics of -2.98315 read from the upper region of the vector error correction model, the evidence indicates that inflation has a negative and long run considerable effect on economic growth in Nigeria within the period under investigation. However, in the short run effect as shown from lower region of the VECM result, inflation is not statistically significant in predicting economic growth in Nigeria.

Hypothesis 11: Unemployment do not have any significant long run equilibrium relationship with the changes in economic growth in Nigeria within the period under investigation.

The study also evaluated this hypothesis with the help of vector error correction model (VECM). The t-statistics of the Error correction term yielded a coefficient of -1.042 for unemployment at the upper region of the VECM which indicates that unemployment have negative but weak long run significant equilibrium relation with economic growth in Nigeria within the period under investigation. A look at the lower region of the result which represents the short run relationship between the series showed that though unemployment maintained its negative sign, with the t-statistic value of -0.10788, it is clear that the short run relationship is not significant.

Hypothesis 111: Interest rate have not significantly predicted economic growth in Nigeria from 1980 to 2016.

The researcher equally used the coefficient of the t-statistics of the upper region of the vector error correction result to test this hypothesis. As shown from the regression result, with the coefficient of t-value of -7.4150 for interest rate at the upper region of the VECM, it is clear that interest rate have a negative long run significant impact on economic growth in Nigeria.

As regards the short run effects as shown by the lower region of the VECM results, there is also a short run negative link among interest rate and gross domestic product. However the coefficient is not statistically significant.

Hypothesis IV: Causality does not significantly run from the selected macroeconomic variables to economic growth in Nigeria between 1980 and 2016.

There is bi-directional causal relationship between inflation and economic growth in Nigeria within the period under review. This was confirmed by the granger causality

test. However, the granger causality tests confirmed that a uni-directional causality runs from economic growth to interest rate.

Findings

The research was undertaken to analyze the impact of macroeconomic factors (unemployment, inflation and interest rate) on economic growth in Nigeria. To achieve this, various data on GDP, unemployment, interest rate and inflation rate were collected from 1980-2016. These variables were then subjected to multiple regression analysis, using VECM estimator, with GDP as its dependent variable. The summary of the findings are given below;

- There was a negative and significant relationship between economic growth rates and unemployment in Nigeria during the years under review, suggesting that increase in unemployment rate reduces the rate of economic growth in the country. The research found negative non-linear relationship between unemployment and economic growth rate which corroborated Rafindadi (2012). This result is consistent with the Okun,s law that increase in unemployment may reduce growth rate of output but by more than proportionate increase in unemployment. This result is consistent with the a priori expectation of the study.

- There was a negative and significant relationship between economic growth rates and inflation in Nigeria during the years under review as indicated by the overall result, suggesting that increase in inflation rate reduces the rate of economic growth. This result is consistent with the a priori expectation of the study

- There was a significant positive intercept, suggesting that there are other exogenous variables apart from unemployment, interest rate and inflation that exact significant impact on the economic growth rate in Nigeria. This confirmed the Keynesian position that growth of the economy proxy by GDP has autonomous component.

- The results of unit root test revealed that all the variables of the model were found to be stationary at 1percent. The result further indicated that economic growth rate (GDP) unemployment rate (UN) and inflation rate (INF) and interest rate (IT) were stationary at first difference 1(1); The ADF statistics for all the variables are less than the critical values in negative direction.

- The Johansen cointegration test revealed the existence of long run relationship between the variables of the model suggesting that unemployment, interest rate and inflation may influence the rate of economic growth in Nigeria

. Recommendations

The main aim of monetary policy should be the pursuit of a low and stable rate of inflation. Once this is achieved, a conducive economic environment is created and finally economic expansion leads to reduced unemployment rate. Government should endeavour to provide stable supply of power, good roads for transportation of goods and people, functional legal system, security of lives and property, infrastructural facilities etc. All these would boost employment by making goods and services readily available to meet the ever increasing demand in order to prevent inflation and subsequently lead to industrial

expansion and improvement in growth rates of the economy which would provide employment opportunities for the people.

Infrastructure should be improved such as roads and electricity to make the cost of production less in order to make our manufacturers make more profit. The monetary authorities should adopt inflation targeting framework, it helps avoid time inconsistency in monetary policy and helps keep the public informed. It helps to ease the effect of external shocks on the economy and avoid radical shifts in monetary policy. It helps anchor the expected inflation and also to avoid political interference in monetary policy. Nigerian government should try to have employment targets they should consider to pursue supply-side policies to improve the structure and functioning of the labour market rather than demand management policies Nwoko (2006). The policies that can reduce unemployment in Nigeria are, to diversify the economy, promotion of home made goods, agricultural transformation initiative and also a great environment for much needed investments must be created.

REFERENCES
Aminu, J.C & Anono, H.E. (2013). *Modern macroeconomics: theory and application*, Joanne Educational Publisher Ltd, Nigeria

Ayesha, A. & Wajid, G. (2013). Revisiting the relationship between inflation and growth: a note on the role of exchange rate regimes', *Economic Issues 16(1)*, 37 – 52.

Auwal, A (2013). Youth unemployment and NDE self-employment programmes. *The Nigeria Journal of Economic and social Studies 41(1)*

Bakere, K.G. (2012). Rate of unemployment and inflation: an analysis of aggregate, *proceedings of the annual conference of the Nigerian economic society*: 34.

Gokal A. & Hamif S. (2004). Warning: inflation may be harmful to your growth, *IMF Staff Papers, Vol. 45, pp. 672-710.*

Granger, C.W.J.(1981). Investigating causal relations by econometric models and cross-spectra method: *Econometrica: Vol:37*

Granger, C.W.J (1988). Some recent developments in a concept of causality. *Journal of Econometrics 39: 199 – 211*

Gujarati, D.N. (2004). *Basic Econometrics*: (3rd ed.) New York: Macgraw-hill Inc

Gujarati, D.N. (2005). *Basic Econometrics*: (4rd ed.) Tata McGraw-hill company Ltd

Igbatayo, S. & Agbada, A.O. (2012). Inflation, savings and output in Nigeria: approach. *Journal of Emerging Trend in Economics and Management Sciences* (TETEMS): 3(5)

Ismaila, M. (2015). An investigation of the relationship between inflation rates and economic growth in Nigeria, 1980 – 2015. *Journal of Economics and International Finance. 1(4), 093-011*

Mohammad Umar & Raza,.I (2013). Symposium on growth and interest rate: *Journal of economic Perspective: 3(2)*

Mahmound, N. (2013). An empirical investigation of the exchange rate pass-through to inflation in Tanzania*, IMF Working Paper /06/150, 4-7.*

Mohseni et al. (2016). The effect of interest rate, inflation rate, on real economic growth rate in Jordan. Asian Economic and Financial Review, 9(3), 328-394.

Mundell, R.A. (1968). *International economics,* New York: Macmillian.

Mundell, R.A. (1963). *Macroeconomics for open economies:* London: Dryden Press.

Nwoko, S.G. (2006). Estimating disguised unemployment in Oyo state. paper presented at the *Nigerian Association of Agricultural Economics annual conference*

Patrick, E. (2013). An investigation of the relationship between inflation rates and economic growth in Nigeria, 1970 – 2013. *Journal of Economics and International Finance. 1(4), 093-098*

Rafindadi, A.P (2012). *Inflation, savings and growth in the developing countries* London Macmillan Press Ltd.

Saymeh, A. A. F. & Orabi, M. M. A. (2013). The effect of interest rate, inflation rate, on real economic growth rate in Jordan. *Asian Economic and Financial Review*, 3(3), 341-354.

Semuel, H. & Nurina, S. (2015). Analysis of the effect of inflation, interest rates, and exchange rates on gross domestic product in Indonesia. *Proceedings of the International Conference on Global Business, Economics, Finance Social Sciences (GB15_Thai Conference), Bangkok, Thailand, 20-22 February 2015 Paper ID: T507, 1-13.*

Shahid, M (2014). Does inflation harm economic growth in Jordan? An econometric analysis for the period, 1970 –2000. *Int. J. Appl. Econom. Quant. Stud. 1(2):41-66.*

Snowdon, B. & Vane, H.R., (2005). *Modern macroeconomics: its origins, development and current state*, Edward Elgar, Cheltenham, U.K.

Stockman M (1981).Non-linear effects of inflation on economic growth, *IMF working paper/staff papers. http://www.palgrave.journals.comon February 13*.

Umoru, A. & Anyiwe, J. (2013). The effect of inflation on the growth and development of the Nigerian economy: An empirical analysis, *International Journal of Business and Social Science, Vol. 3, No. 10, pp. 187-188.*

Wiza, M. (2014). An investigation of the relationship between interest rates and economic growth in Nigeria, 1980 – 2014. *Journal of Economics and International Finance. 1(4), 093-052*

Wooldridge, M.J. (2002). *Econometric analysis of cross section and panel data:* The MIT press: Cambridge, Massachusetts: London, England

Appendix 1: Unit root test

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.554300	0.0067
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Source: Author`s Computation using Eview 9.5

Appendix 2: Unit root test

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.541158	0.0626
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Source: Author`s Computation using Eview 9.5

Appendix 3: Unit root test

Null Hypothesis: INT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.173142	0.0575
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Source: Author`s Computation using Eview 9.5

Appendix 4: Unit root test

Null Hypothesis: UM has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic
Augmented Dickey-Fuller test statistic		-0.454652
Test critical values:	1% level	-3.626784
	5% level	-2.945842
	10% level	-2.611531

*MacKinnon (1996) one-sided p-values.

Source: Author`s Computation using Eview 9.5