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Analysis of Business Cycles and Economic Growth in Nigeria (1970-2012)

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Abstract:

The study of economic fluctuations and the international policies needed to shield the world economy against World Economic depression have given a renewed stimulus to research interest in the linkages between Business cycles and economic performance at country specific. There is no doubt that many studies have attempted to analyze Business Cycles but very few have checked for the direction of causality between Business Cycles and Economic Growth. This research tests for causal relationship between Business Cycles and Economic growth in Nigeria employing systematic econometric methods such as the Johansen Cointegration test, vector autoregressive models (VAR) and Granger causality tests using annual data from 1970 to 2012. The study found that there is a Bi-directional Granger Causality running from the independent variables (M2, GEXP) to the target variable (GR) and also a unidirectional causality running from EXR to GR. No causality was found to run from DINTR to GR. We used the Impulse Response Function to achieve the two remaining objectives; That actually shocks in these independent variables proxied for the Business Cycles affected the Economy within the time period and also that Money Supply shocks is the most Important to the economy because of its impacts to the economy, if not keenly watched is likely to have a detrimental impact on the nation's economy. Given the findings, the empirical assessment has direct policy relevance in Nigeria.

Keywords: Business Cycles, Interest rate, Public Finance, Money Supply, Exchange rate. **JEL Classification:** E3, E32, E4, E5, E51

1. Introduction

The Nigerian Economy has been significantly affected by events in the international economic sphere as evidenced by the impact of subsequent world financial and economic depression and shocks. Declining Investments, commodity price collapse, capital market downturn, divestment by foreign investors have caused a decline in Economic growth in Nigeria. Other shocks are crude oil price shock, low crude oil demand shock, foreign debt shock, inappropriate policy response to observed economic trends in terms of timing, direction and magnitude, currency over-valuation; disequilibrium between rural and urban sectors and institutional shocks ((Lucas 1977 as contained in Kydland and Prescott 199, 1982).

The trend of the Nigerian economy is explained in a line graph with the aid of figure 1

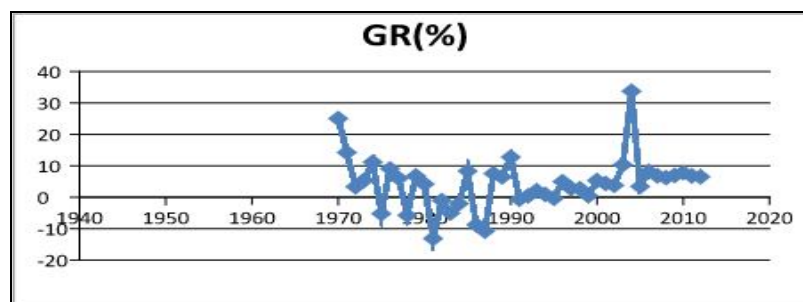


Figure 1: The trend of the Nigerian economy
Source: Data from the Central Bank of Nigeria

The graph below shows the growth rate of Nigeria from 1970-2012. The growth rate has been highly volatile and caused by many factors and forces both internationally and locally. In the 1970s, the economy was expanding due to large inflow of petroleum revenue and by the period 1981-1985, at the wake of the falling oil revenue, the economy drastically declined (Iwayemi 1995, Agenor et al 2000, Lane, 2002).

In response to these various shocks, authorities in Nigeria adopted various economic policy measures which include Stabilization Policy, 1981-1983; Structural Adjustment Programme (SAP), 1986-1992; Medium Term Economic Strategy, 1993-1998 and the Economic Reforms 1999-2007. It is important to note that developing economies like Nigeria are small open economies which cannot influence world prices and output. This made domestic macroeconomic policies buffeted by external shocks which eventually distort the path of sustainable economic growth. In view of the above discussions this paper addresses the following questions.

- Is there a causal relationship between business cycles and economic growth in Nigeria?
- What are the effects of business shocks on economic growth in Nigeria?

1.1. Objective

The broad objective of this paper is to analyze business cycle and trace the transmission of shocks between business cycle and economic growth. The specific objectives are:

- To investigate the existence of a causal relationship between business cycles and economic growth in Nigeria.
- To investigate the effects of business shocks on economic growth in Nigeria

1.2. The Significance of the Study

This paper is useful for policy makers and analysts in understanding the probability of a causal relationship between business cycles and economic growth in Nigeria. There is every need for authorities to ensure that policies that will boost the economy during recession would be proposed and implemented effectively. If the economy follows the neutrality hypothesis of no causal relationship, the necessary authorities will also be aware and as such, lay more emphasis on other variables that affect or cause growth. Finally, study will be of use to other researchers as a point of reference for further research studies.

1.3. Literature Review

There are many theories associated with business cycles. Prominent among them are Frisch – Slutsky Paradigm, New Keynesian School (1936), Monetarist Theory On Business Cycle, Real Business Cycle (Finn E. Kydland and Edward C. Prescott, 1982), Australian Business Cycle and Multiplier—Accelerator Theory . The Frisch-Slutsky Paradigm which was named after Norwegian Ragnar Frisch and Eugene Slutsky identified three components in business cycle fluctuations—as shown in Figure 2 below



Figure 2: Frisch-Slutsky Business Cycle Paradigm

The first component is a shock that triggers business cycle. However, the shocks that are produced may have varying identity from the impulse that started them because the impulse acts through a propagation mechanism that converts one-time shocks into persistent business cycle fluctuations. Propagation mechanism is the middle stage which converts the process into business fluctuations. The third and the final components is the business cycle which is the end-product of the reaction of the impulse in the economy. The shocks can be monetary, fiscal policies, shift in desired consumption, Investments, Oil price shocks etc.

The Keynesian model states that substantial economic slumps come from falling aggregate demand. When Aggregate Demand falls, producers of goods and services lose revenue and are forced to adjust. How does the market handle this economic adjustment? In order for businesses to maintain profit levels, they must reduce production costs. But cost cutting is difficult because of what economists call 'sticky wages and prices.' The New Keynesian School states that Recession is caused by inadequate aggregate demand and results when market is not effective. Keynesian theory is focused on market failures and how the government can play a pivotal role in correcting the imbalances. Keynesianism has many facets in which market imperfections can be looked at; one part says that Product market monopolies keep prices too high and output too low, so that unemployment moves up. Another opined that it is the labour market that does not function well, wages are sticky, and unemployment is high. Another sees flaws and failings from the credit market and banking, which now produces fluctuations and recessions, all these market failings and imperfections results to huge fluctuations and inefficient business cycles (Wikipedia, 2011)

Cutting wages can cut morale and, in turn, cut productivity. In the end, employers wind up cutting people altogether in order to escape the sticky situation. So stickiness translates into higher levels of unemployment. Unemployment leads to decreased spending and further depresses aggregate demand. Falling aggregate demand combines with wage stickiness, dragging the economy into systemic crisis Monetarist Theory on business cycle is of the view that Business Cycle is tied to Money Supply which can be excessive or restrictive. This theory is most associated with Friedman, Schwartz, R. Hawtreys. It states that a fluctuation in the economy is caused

by Money Supply. The famous statement by Schwartz and Friedman “Business Cycle is a Monetary Phenomenon” seems to buttress their point. Monetarists are of the view that an increase in Money supply leads to an increase in quantity of money, a fall in interest rate, an increase in real money balances, fall in currency value, increase in investment demand and export.

Real Business Cycle Theory challenged Keynesian views business cycle as fluctuations due to technology shocks. This theory is most associated with Kydland and Prescott (1982) and more generally the Chicago school of economics. They consider that economic crisis and fluctuations cannot stem from a monetary shock, only from an external shock, such as an innovation. In this theory, *Finn and Prescott* opined that the economic fluctuations cannot come up from the shocks outlined above (*Frisch and Slutsky Paradigm*). They said that business fluctuations emanates from technology shocks and innovations. Empirical evidence was used to buttress their view on business cycles. This theory is different from others in many aspects; Firstly, it is an equilibrium theory: the booms and busts are treated as equilibrium rather than disequilibrium. The fluctuations are due to real (technology) shocks, with markets adjusting quickly and always in equilibrium (Dornbusch, Fischer & Startz 2008);

Friedman and Schwartz (1963) compiled monetary and banking history data from 1917-1944 and contended that there is a strong correlation between monetary aggregates and output and innovations. Monetary variables have the potential for remedying cyclical fluctuations. A study by Rotemberg and Woodford (1994) showed that the implications of forecastable movements in labour productivity are small and only related to forecasted changes in output. On the contrary, the same study revealed that forecasted movements in investment are positively and significantly correlated with movements in outputs.

Chatterjee (1999) found a strong association between up and down movements in the money supply during the pre-war period in the United States and up and down movements in the pre-war GNP. Rand and Tarp (2002) use the Bry-Boschan (1971) procedure to document the business cycle dates and durations for fifteen developing countries (Nigeria inclusive) for the period 1980 to 1998. They make the key finding that developing country business cycles are definitely shorter than those of the industrialized countries (Rand and Tarp, 2002).

Christiano and Fisher (1998) and Greenwood et al. (1998) evaluate business cycle models in which a major driving force for fluctuations is variations in capital-embodied technical change. They test the embodied technology view by examining the ability of their models to account for various business cycle phenomena and found that about three-quarters of output fluctuations are due to this shock.. Greenwood et al. (1998) find that about 30 percent of business cycle variation in output can be attributed to capital-embodied technical change.

Dungey and Pagan 2000 analyzed the historical decompositions of the Australian growth cycle and found that the 1990s recession is marked by a decline of domestic demand and tight monetary policy, with weak overseas activity causing the cycle to persist. Furthermore, they found that the Asian crisis had a negative impact on exports, and the effect is offset by good conditions in asset markets. Lane (2003) in his paper confirms that emerging market economies have experienced much more volatile output and income fluctuations and that these have been further exacerbated by inappropriately procyclical macroeconomic policies. Lee et al (2003) applied a VAR to analyze the role of US and Japanese business cycles on Australian economy and found that the fluctuations of output in the US and Japan have strong impact on Australian business cycle. In addition to oil price shocks. Furthermore, they found that the linkage between the US and Australian business cycles became stronger since early 1980s, while the linkage between Australia and Japan became weaker after 1990s. Buckle et al. (2007) employed a structural VAR in analyzing the New Zealand business cycles based on the small, open economy assumption. They found that the international business cycle and the fluctuations of import and export prices play a dominant role for the New Zealand business cycles.

Alege 2009 shows that not only do business cycles exist in the Nigerian economy; modern computational methods can be used to capture the phenomenon. The results also suggest that productivity shock is relevant to the Nigerian economy in the same way Kydland and Prescott (1982) propose. The result shows that productivity shock, money supply growth shock and export supply growth shock contributed in the statistical sense in explaining business cycle as driven by both real and nominal shocks. Also, Alimi and Atanda (2011) found out in their work on Globalization, Business Cycles and Economic growth in Nigeria that the cyclical movement in foreign direct investment as a proxy for business cycle has significant effect on economic growth in Nigeria.

1.4. The Model

A VAR model was used in order to capture the transmission of structural shocks of some macroeconomic variables that pivots the economy. A Vector auto regression (VAR) process of order k is given as;

$$= \dots\dots\dots (1)$$

Where is an $L \times 1$ vector of innovations, and $\{i = 1, 2, \dots, k\}$. In this case, $L = 4$ and

$$= \{GR, M2, INTR, GEXP, EXR\}$$

where each variable denotes Growth rate (GR), Money Supply (M2), Interest rate (INTR) Government Expenditure (GEXP), and Exchange rate (EXR) respectively.

Equation (1) can be re-written to capture individual equations in accordance with the variables used to analyze Business cycles and economic growth. Equation 1 is specified in econometric technique with no specific variable being regarded as the dependent. Thus:

Where

GR=Growth Rate

M2= Money Supply

INTR= Interest Rate

GEXP= Government Expenditure

EXR=Exchange rate

Δ = first difference operator

$\alpha, \beta, \theta, \sigma$ and ϵ = parameters to be estimated and ϵ represents the Serially Uncorrelated error terms.

1.5. Estimation Tests

To investigate the time-series property in order to avoid spurious regression problem, an Augmented Dickey-Fuller (ADF) test is conducted to test for the order or integration of all series. The ADF test is based on the Null Hypothesis that a unit root exists in the autoregressive representation of the time series. After conducting the test for stationarity and identifying the time series property of the series, A model is constructed to test whether the variables are co-integrated. If the variables are found to be co-integrated, the analysis would continue with VECM (Vector Error Correction Model), if otherwise, it would use VAR (Vector Autoregressive Model). Finally after all the test have been carried out, the IRF (Impulse Response Function) will be employed to capture the transmission of shocks to the economy.

1.6. Results

In this study, an Augmented Dickey Fuller (ADF) test was performed on by the Growth rate (GR), Money Supply(M2), Interest rate (INTR), Government Expenditure(GEXP) and Exchange rate(EXR). In all cases, a constant and a linear trend were included since this represents the most general specification.

Variables	ADF(Intercept & Trend)	5% Critical Value	Order of Integration
GR	-5.866	-3.532	I(0)
M2	-9.662	-3.540	I(2)
INTR	-7.162	-2.955	I(1)
GEXP	-4.409	-2.955	I(1)
EXR	-5.926	-2.955	I(1)

Table 1: Unit Root Test for Stationarity

Following the Dickey Fuller unit root tests for stationarity, a variable is stationary if its ADF value is greater than the critical value at a given level of significance. The level of significance adopted in this research work is the 5% level of significance. According to the results, only Growth Rate (GR) is integrated of order 0, Money Supply (M2) is even integrated of order 2, while Government Expenditure (GEXP), Interest rate(INTR) and Exchange Rate(EXR) are stationary at 1st difference meaning that they are integrated of order 1.

1.7. Cointegration Test

Since the results of the unit root test above confirm stationarity of the variables at 1st difference with the exception of Growth Rate (GR), Money supply(M2) which are stationary at level form and 2nd difference respectively, the Johansen methodologies can then be apply in testing for cointegration (Johansen, 1988,1991, 1992; and Johansen and Juselius, 1990). According to the procedure, the lag length of the VAR which must be small enough to allow estimation and high enough to ensure that errors are approximately white noise must be determined. Using two (2) different information criteria: Akaike Information Criterion (AIC) and the Hannan-Quinn Information Criterion (HQ), the researcher concluded that the optimal lag length for the variables (GR, M2, INTR, GEXP, and EXR) is two (2) as shown below:-

LAG	AIC	HQIC	SBIC
0	59.4405	59.5169	59.6516
1	56.1457*	56.4037*	57.4124*
2	56.8607	57.7004	59.183

Table 2: Lag Selection-Order Criteria

Source: Researcher's Estimation using STATA 12.1.

The uniformity of the conclusions from the Information Criteria in each of the models is worthy of note due to the sensitivity of the Johansen procedure to lag length selection. To determine the number of cointegrating vectors, the Trace test and the Maximum Eigenvalue test was be applied using the more recent values of MacKinnon-haug-Michelis (1999). In this study, the number of cointegrating vectors was denoted by r ; the trace test was calculated under the null hypothesis $H_0: r \leq r_0$, and the alternative hypothesis, $H_1: r > r_0$. The test results are presented in Table 3. If the test statistic is greater than the critical value at a given level of significance (5%), the null hypothesis will be rejected and vice versa. The result for this study is displayed below:-

Rank Test(Trace)	Eigen value	Trace Statistics	5% critical value
0	-	220.7610	68.52
1	0.97841	78.8508	47.21
2	0.73746	29.3655*	29.68
3	0.37098	12.2158	15.41
4	0.18806	4.5076	3.76
5	0.11470		

Table 3: Johansen Test for Cointegration

From the table above we can see that the is less than the and hence the Null Hypothesis is accepted and conclude that the vectors are not cointegrated, which shows that there is no long run relationship between the variables in question. It further shows that the Vector Autoregressive Model will be used.

1.8. Causality Test

The results of Long Run Causality between Growth Rate (GR), Money Supply (M2), Interest Rate(INTR), Government Expenditure (GEXP) and Exchange Rate (EXR) and their respective lags. The Causality will be gotten from the VAR model Results.

Granger-Causality test	F-stat	Lag	P-value
DDM2 does not cause GR	15.412	4	0.004
DGEXP does not cause GR	37.26	4	0.000
DINTR does not cause GR	1.0964	4	0.895
DEXR does not cause GR	26.9	4	0.000
GR does not cause DDM2	23.381	4	0.000
DGEXP does not cause DDM2	468.02	4	0.000
DINTR does not cause DDM2	30.256	4	0.000
DEXR does not cause DDM2	154.5	4	0.000
GR does not cause DGEXP	12.799	4	0.012
DDM2 does not cause DGEXP	88.219	4	0.000
DINTR does not cause DGEXP	5.0511	4	0.282
DEXR does not cause DGEXP	42.183	4	0.000
GR does not cause DINTR	3.3759	4	0.497
DDM2 does not cause DINTR	7.7432	4	0.101
DGEXP does not cause DINTR	6.7938	4	0.147
DEXR does not cause DINTR	10.331	4	0.035
GR does not cause DEXR	1.0296	4	0.905
GR does not cause DEXR	4.422	4	0.352
GR does not cause DEXR	1.9562	4	0.744
GR does not cause DEXR	.85257	4	0.931

Table 4: Granger-Causality Tests

No Causality running from Independent variable to Target Variable (Dependent Variable)

It was found from the VAR model that there is a Bi-directional Granger Causality running from the independent variables (M2, GEXP) to the target variable (GR) and also a Uni-directional causality running from EXR to GR. No causality was found to run from DINTR to GR.

2. The Autocorrelation Test/Langrangian Multiplier (LM) Test

The test for multivariate autoregressive conditional heteroscedasticity (ARCH) can be based on similar ideas as the Langrangian Multiplier (LM) test for residual autocorrelation (Helmut, 2001). Thus, the researcher tested whether the residuals contain heteroscedasticity. The result Is presented below:-

Lag	Chi-Square	Degree of Freedom	Probability
1	92.4560	25	0.00000
2	59.2177	25	0.00013

Table 5: Langrange-Multiplier Test

No Correlation at Lag Order

From the table above, the P-value are less than 0.05 at the required Lag Length, Hence the Null Hypothesis is not rejected and conclude that the residuals are not autocorrelated. This means that there is absence of Heteroscedasticity in the model being estimated.

3. Test for Non-Normality

Although, normality is not a necessary condition for the validity of many of the statistical procedures related to Vector Autoregressive (VAR) model, deviations from the normality assumption may indicate that model improvements are possible. Thus, a multivariate test for non-normality was constructed to check whether the third and fourth moments of the residuals conform to the normal distribution. The results are presented as follows:-

Equation	Chi-Square	Degree of Freedom	Probability
Growth Rate (GR)	1.872	2	0.39225
Money Supply (M2)	9.214	2	0.00998
Government Expenditure (GEXP)	16.222	2	0.00030
Interest Rate (INTR)	2.702	2	0.25901
Exchange Rate (EXR)	6.437	2	0.04002
ALL	36.446	10	0.00007

Table 6: VEC Residual Normality Test (Jarque-Bera Test)

Researcher's Estimation using Stata11

From the table above, since the joint p-value is less than the 5% level of significance, then the null hypothesis that residuals are multivariate normal is accepted. In other words, the Jaque-Bera Statistic is less than the critical value at 5% level of significance.

4. Impulse Response Function

Impulse response functions show the effects of shocks on the adjustment path of the variables. Such shocks might include changes in oil prices, monetary policy, and nominal exchange rate, public expenditure on capital items or project and rise in unemployment. Its computation is useful in assessing how shocks to economic variables reverberate through a system.

This mechanism was used to answer the third question of which is, whether any of the shocks in these variables is important in policy analysis

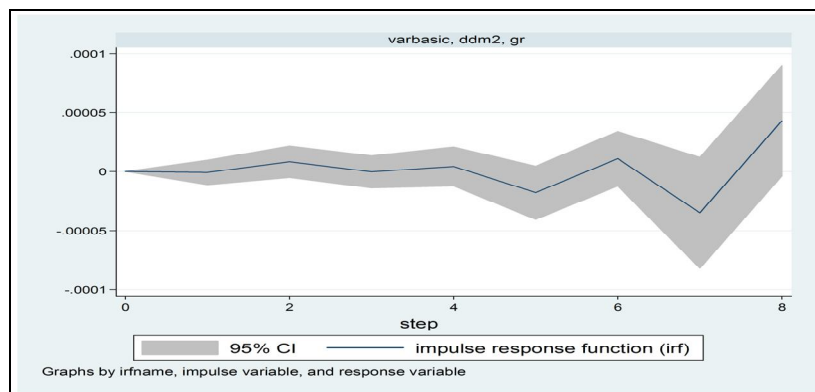


Figure 3: Response of Growth Rate to Monetary Policy Shocks (M2)

As the diagram above depicts, in the first period approximately, shocks in Money Supply led to a rise in economic growth to the second period which fell toward the end of the second period, it now rose slightly going to the third period, from the fourth period, there was a trough in the fifth period, and they was a significant rise going to the sixth period, continuing to seventh period, they was a sharp fall, afterwards there was a sharp rise going to the eighth period. A Factor which is likely to be responsible for the shocks in money supply includes Government's Monetary Policy Stabilization measures.

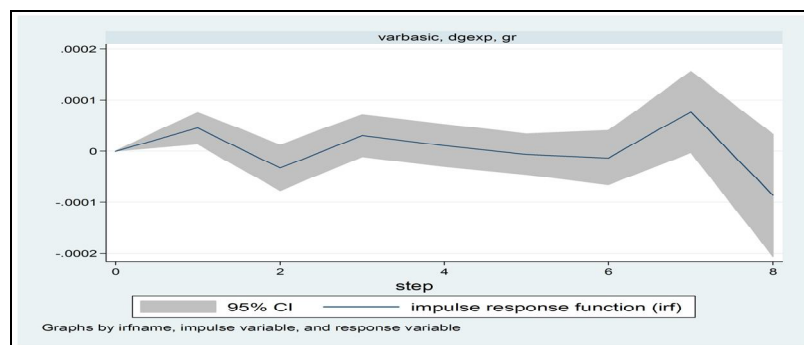


Figure 4: Response of Growth Rate to Fiscal Policy (GEXP)

As the diagram above depicts, in the first period approximately, shocks in Government Expenditure led to a rise in economic growth, from the graph above we can see that subsequent positive shock to the economy by government expenditure, it shows that there was a slight fluctuation, there was a sharp rise from period 6-7 and a sharp decline towards 8th period. Factors which are likely to be responsible for the shocks in government expenditure includes, increases in government capital projects, creation of more states and the increase/expansion of the public sector

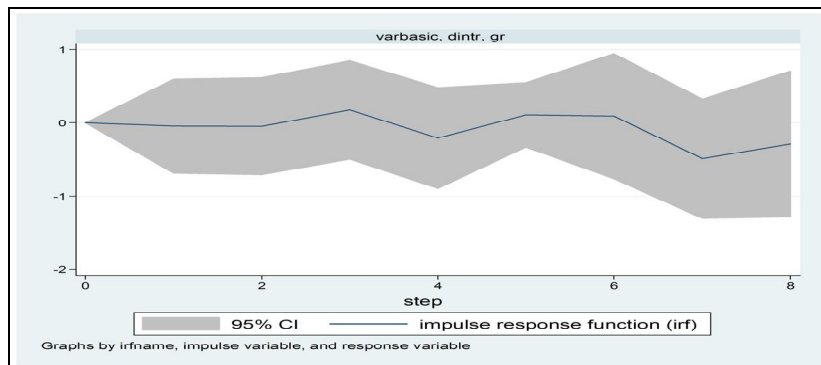


Figure 5: Response of Growth Rate to Monetary Policy Shocks (INTR)

As the diagram above depicts, Shocks in interest rate led to constant movement in economic growth in the first period towards the second period, then it fell slightly towards the fourth period, and improve towards the 6th period, from there it now fell in the 7th period and then evens out. Factors that are responsible for fluctuations in Interest rate can be include the government monetary policy stabilization measures.

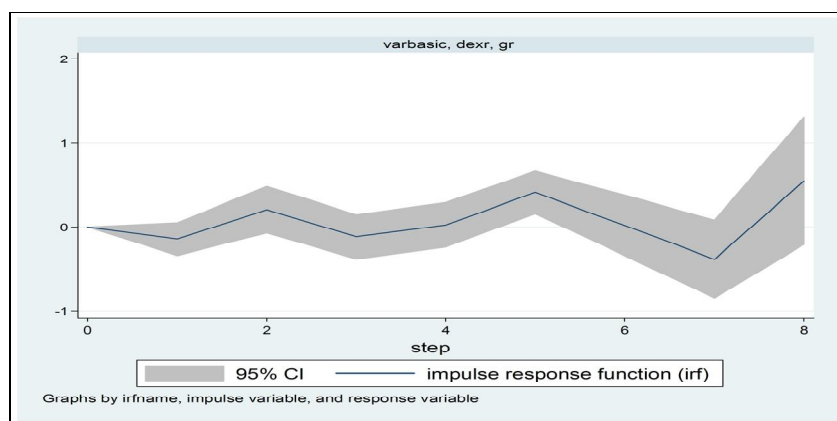


Figure 6: Response of Growth Rate to External Shocks (EXR)

As the diagram above depicts, in the first period approximately, shocks in the national currency will lead to an increase in economic growth in the first period, slight peak, and fell, the economy showed recovery up to the fifth period and now constantly fell till the seventh period, but finally peak in the eight periods. Factors that are responsible for fluctuations in Exchange rate can include the Government's trade policies and important external factors that are outside the control of the state that is why Nigeria is still referred to as a small open economy.

From the results above, it can be seen that the Monetary Policy Variable, Money Supply is the most important in policy analysis and recommendation because of its significant influence on Economic growth rate in Nigeria. The money supply is determined by Government Monetary policy objectives like the Monetary base, Monetary multiplier, Reserve Ratio etc.

The role of Money Supply in the Nigerian economy cannot be over-emphasized, if the Federal Government through the Monetary Policy Authority (CBN) reduces the supply of Money, Banks and the surplus side of the economy will discover that there is less fund available to lend out, making them to charge higher interest rate (cost of borrowing) leading to the lowering of the aggregate demand, thereby making price to come down. On the other hand, If the CBN increases Money Supply in the economy, this will lower interest rate in other to increase borrowing, thus boosting Aggregate demand and hence increase in output.

5. Conclusions

In the research work, the researcher empirically verified and discussed the causal relationship between Business cycles and Economic Growth, it was found out that there was a Bi-directional Granger Causality running from the independent variables (M2, GEXP) to the target variable (GR) and also a Unidirectional causality running from EXR to GR. No causality was found to run from DINTR to GR.

The attendant effect of the fluctuations in some selected macroeconomic variables on the economy, results shows that shocks in these Independent variables proxied as Business Cycles actually affected the economy, and finally which of the said shock is the most important, It was found that Shocks in Money Supply was the most important to the economy, and so it should be kept on a close watch, so as to make the economy continue on its economic growth path

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