

INTEREST RATE AND CREDIT SENSITIVITY OF SECTORAL OUTPUT IN NIGERIA

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ABSTRACT

The Keynesian framework for the transmission of monetary policy to real sectors of the economy proposes that changes in the cost of capital will lead to changes in investment culminating to a change in output measured in GDP. Conventionally, a reduction in interest rate will all things being equal stimulate economic activities that will trigger substantial growth in the economy. The existence of structural rigidities in most developing countries like Nigeria renders monetary policy ineffective and distorts the link between interest rates and sectoral output performance. This study seeks to investigate the relative responsiveness of sectoral output to changes in interest rate and credit allocation in Nigeria. The study will make use of quarterly time series data spanning over a period of 23 years, sourced directly from the CBN and the National Bureau of Statistics. The paper utilized the impulse response function and Granger causality test to examine the sensitivity of sector output to changes in interest rate and credit. The intention is to understand the dynamic sensitivity of sectoral output to changes in interest rate and credit allocations. The result obtained from the study show the various sectors of the Nigerian economy responds significantly to credit allocation but not to interest rate. The result concludes that the use of interest rate to influence sector output growth for Nigeria is in-effective while efforts should be channelled at selective credit allocation and a mix of monetary and fiscal policy to achieve the desired macroeconomic short term and long term goals.

JEL: E43, E51, E23

KEYWORDS: Interest Rates, Credit Sensitivity, Sectoral Output

INTRODUCTION

Interest rate and credit allocation impacts on every sector of the economy but not on an equal basis manner or in a unidirectional pattern (Pellényi, 2012). This heterogeneity of the sensitivity of sectoral output to interest rate and credit allocation is of paramount implication in the scheme of monetary policy because the distributional consequences can distort the channel of monetary policy transmission mechanism. Thus, sectoral heterogeneity is an evident challenge to monetary policy. Mainstream economic thought, prior to the great depression, was based on Say's law that anchors on the assumption that supply creates its demand. That is; the economy consumes whatever it produces so that the economy is always in a state of equilibrium. The Keynesians reversed the classical assumption with the argument that the economy cannot maintain itself at full employment as a result of some structural deficiencies and rigidities in the system. Keynes, therefore, postulated that a combination of monetary and fiscal policy is needed to stimulate the economy by inducing investment directly. He reasoned that a reduction in interest rate will automatically stimulate investment that will have a positive impact on the various sectors of the economy.

Bernanke and Kuttner (2005), in their study on the reaction of the stock market to federal reserve policy noted that the tightening of monetary policy may be viewed as mild aggregately, but it may be excessive for some specific sectors producing strong distributional effects within the economy.

In a similar study carried out on the Ugandan economy, Nampewo, Munyambonera and Lwanga (2013), found monetary policy to exert an adverse significant effect on sectoral growth and on the overall economy with the conclusion similar to the recent findings by Asghar and Hussain (2014), “that different sectors of the Pakistan economy responds to monetary policy shocks at different times and in different ways”. Nigeria like most developing economies in Sub-Saharan Africa has embarked on several reforms in the financial service sector with the most recent reform being the banking sector reform of 2004 in which all commercial banks were mandated by CBN to meet the N25, billion minimum paid-up capital by 31st December 2005. Despite the strengthening of the financial service sector with the series of merger and consolidation that has taken places in Nigeria since 2005, most sectors of the economy are still underfunded and burdened by the high cost of credit.

Recent studies conducted by Salami and Kelikume (2011) on the linkage between the manufacturing sector and other sectors of the Nigerian economy showed that there exist the financial service sector and the real sector of the Nigerian economy. This explains why various sectors react differently to monetary policy shocks. According to Adolphus J. Toby & Deborah B. Peterside (2014), Nigerian banks are highly liquid, but they presumed that lending to the agriculture and manufacturing sectors are extremely risky. Hence, they believe intensifying credit to these sectors is unjustifiable and unwarrantable with respect to the risk and cost. In the empirical literature, the monetary transmission mechanism is considered broadly without taking into account the grass root impact of changes in interest rate and credit allocation on the various sectors of the economy. The mechanism via which interest rate and credit affect growth is indirect as any change in interest rate will first influence the level of investment in different sectors before affecting the gross domestic product GDP as a whole.

The consideration of how the various sectors respond to changes in monetary policy will help provide a guide in understanding the monetary policy mix to be adopted by monetary authorities to ensure steady growth in virtually all the sectors of the economy (Nwosa and Saibu, 2012). This study is urgent considering the observation of Ndekwa (2013) that boom and busts cycles exhibited in the Nigeria financial markets can engender strong and opposing effects on credit allocation and output growth in the real economy and, hence, on the effectiveness of CBN’s monetary policy. Hence, this study is meant to examine the interest rate and credit sensitivity of sectoral output in Nigeria. The remaining parts of this paper is organized as follows; the literature review is carried out in the next section while the discussion on the data and methodology comes up after the literature review. Following the discussion on the data and methodology, is the presentation and analysis of the result while the final section concludes the study.

LITERATURE REVIEW

The literature is rich with attempts to study the impact, sensitivity and causality of interest rate and credit on sectoral output (Deodola and Lippi 2000; Hayo and Uhlenbrock 2000; Farès and Srour 2001; Raddatz and Rigobon 2003; Irvine and Schuh 2004; Adebisi 2006; Pellényi (2006); Tena and Tremayne 2006; Cortes and Kong 2007; Waheed 2006; Josephine 2008; Majid 2008; Saibu and Nwosa 2011; Saibu and Nwosa 2011; Haruna, Yahya and Nasiru 2013; Onuonga 2014 & Asghar and Hussain, 2014). Others notable studies focused on the link between financial system and economic growth (Beck, Levine & Loayza 2000; Ajisafe & Folorunso 2002; Levine 2005; Dey & Flaherty 2005; Adebisi 2006; Akinlo 2007; Chimobi & Uche 2010; Cappiello, Kadareja, Kok Sorensen & Protopapa 2010) Generally, two main hypotheses have evolved in the literature that links output to interest rate and credit. The two hypotheses are the finance-led growth hypothesis and the growth-led finance hypothesis. The former states that the financial liberalization that reduces interest rates will transfer idle resources from the surplus to the deficit sector thereby stimulating growth while the later states that demand for financial services induced by real economic growth will result in an expansion of the financial sector.

Several studies used different methods to analyse and examine the responsiveness of sectoral output to interest rate changes. The studies by Deodola and Lippi 2000; Hayo and Uhlenbrock 2000; and Irvine and Schuh 2004, used the Vector Auto-Regression (VAR) to study the effect of monetary policy shocks on output while Josephine (2008) employed the simple regression analysis to analyze the impact of monetary policy shocks on the economy. Adebisi 2006; Majid 2008; Saibu and Nwosa 2011; Haruna, Yahya and Nasiru 2013 and Onuonga 2014 all applied the Auto-Regressive Distributed Lag (ARDL) model and Error Correction Model (ECM) to examine the disaggregated effect and dynamic response of output to monetary policy shock. Pellényi (2006) using structural factor model to analyze the sectoral impact of monetary policy in Hungary found that the output response of industry, construction and trade are very strong. The result strongly suggests that each sector reacts differently to monetary shocks. Further, within manufacturing, subsectors producing durable goods respond more to a monetary expansion.

Early studies by Koivu (2002), on the finance-growth nexus using the fixed-effect model and unbalanced panel data from 25 transition countries, demonstrated that the interest rate margin was negatively and significantly related to economic growth. In addition, the study found that an increase in the quantum of credit did not spur economic growth, thereby concluding that credit growth has not always been sustainable and may actually decline. Arnold and Vrugt (2002), evaluated the impact of monetary policy shocks on sectoral output in the Netherlands. In their conclusion, they found large sectoral variation in monetary policy transmission. Dey & Flaherty (2005), using a two-stage least square regression model to test the impact of bank credit and stock market liquidity on output growth, found that bank credit is not a determinant of GDP growth. Dedola and Lippi (2005), investigating the differential output effects of unanticipated monetary policy shocks with industry data from 5 OECD countries, found that the impact of monetary policy is more robust in industries that produce durable goods, which are more capital-intensive and with little borrowing capacities. Besides, the output effects of policy shocks seemed more robust in industries with higher interest rate burden.

Tena and Tremayne (2009), analyzing the UK data, found cross-sectional differences across industries and asymmetries in different sectors to a monetary policy change. Alam, and Waheed (2006), examining channels of monetary transmission mechanism in Pakistan across several sectors of the economy, found the manufacturing, wholesale and retail trade, finance and insurance sectors declined significantly with changes in the rate of interest while the agricultural sector, mining and quarrying, construction, and ownership of dwellings were insensitive to interest rate changes. Cortes and Kong (2007), examining the impact of monetary policy on the Chinese economy, found bank lending rate to be a robust indicator of monetary policy in China. The result obtained from the study revealed that the response of different province in China to monetary policy changes were positively linked to the share of loans allocated to industrial firms and the primary sector of the country's aggregate output.

Cappiello, Kadareja, Kok Sorensen Protopapa (2010), using a panel data approach to study the relationship between bank loans, credit standards and output in the Euro area found that the effect of the supply of credit on GDP was positive and statistically significant. The few studies in the Nigeria on sector responsiveness to credit have been inconclusive and scanty. The study by Akinyele and Osinubi (2006), pointed out that the real sector of the Nigerian economy has depended largely on the banking system for working capital with which to acquire inputs. However, increases in bank lending rates complicate the problems of rising cost of working capital which altogether slows the productivity and in the performance of the sector. Ikenna (2012), using an Autoregressive Distributed Lag (ARDL) test for the possibility of a credit crunch in the real sector, revealed that deregulation had an adverse effect on the credits allocation to real economic sectors in the long run. He concluded that Deposit Money Banks in Nigeria have an aversion towards lending to the real sector. Nwosa and Saibu (2012), investigating the channels of monetary transmission across the different sectors of the Nigerian economy, found that the channels through which monetary policies were transmitted to various sectors were different. On the one hand, interest rate channel was liable for the

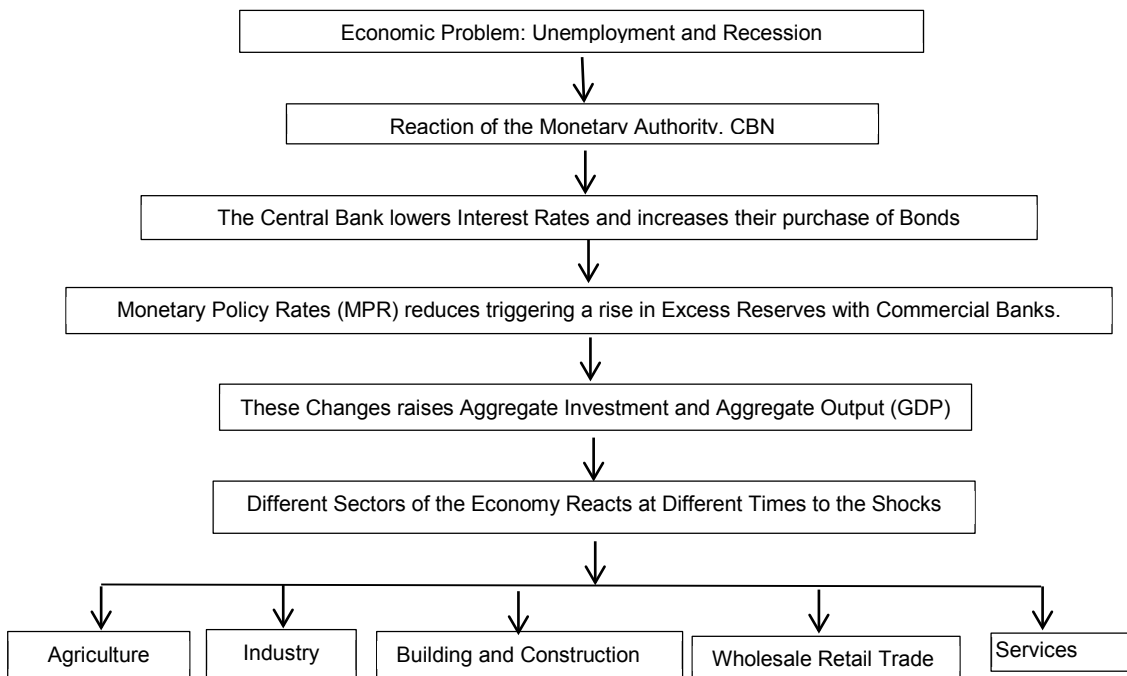
transmission of monetary policy impulse to the agriculture and manufacturing sectors whereas the exchange rate channel transmits monetary policy impulse directly to the building and construction, mining, service and wholesale and service sectors. In a similar study, using auto regressive distributed lag modelling technique, Haruna and Yahya (2013) conclude that relationship between private sector credit and economic growth to support the growth-lead finance hypothesis in the long-run.

In carrying out a study that links various sectors of the Nigerian economy, a proper classification and identification of the sectors need to be established. Currently, the economy can be broadly classified into five (5) main activity sectors namely, Agriculture, Industry, Building and Construction, Wholesale and Retail Trade and the Service sector. Existing studies reviewed in the Nigerian economy have so far explored the relationship between monetary policy and growth by concentrating on aggregated output relegating sector-specific analysis to the background (Ajisafe & Folorunso 2002; Adebisi 2006; Akinlo 2007; Chimobi & Uche 2010). This study hopes to explore and narrow the gap in the literature by examining the sensitivity of sectoral output to changes in interest rate and credit.

DATA AND METHODOLOGY

In the context of the Nigerian economy, this research is carried out using quarterly secondary data sourced from the Central Bank of Nigeria and the National Bureau of Statistics. The quarterly frequency date covers the period 1990 to 2012 for the five major activity sectors in Nigeria. Following the Keynesian framework for analysing monetary policy impact on the economy, an expansionary monetary policy will impact sector output through an increase in investment induced by a fall in interest rate. This will further increase credit to the private sector and decrease exchange rate but the extent to which monetary policy impacts output depends on the extent to which the various sectors respond to changes in monetary policy tool.

Figure 1: How Changes in Monetary Policy Affects the Economy Using the Keynesian Framework



This figure shows how changes in monetary policy impacts on the economy using the Keynesian framework: In the Keynesian model, changes in monetary policy affects interest rate which in turn affects investment spending and aggregate demand but the various sectors of the economy reacts differently to the shocks emanating from the change in monetary policy.

Model

Adopting model from the work of Shabri Majid (2008), Nwosa and Saibu (2011) and Haruna et al (2013), the functional model for sector output sensitivity to the private sector credit and interest rate is stated as follows;

$$Y_{it} = f(INT, CPS) \tag{1}$$

Where Y_{it} is the contribution of the i th sector to gross domestic product, INT is the prime lending rate while CPS is the credit to the private sector. The prime lending rate is considered to be appropriate because it is the lowest rate offered to credit worthy customer and this has a direct bearing on investment. The model expressed in estimation form is expressed as follows;

$$Y_{it} = \beta_0 + \beta_1 INT_t + \beta_2 CPS_t + u_t \tag{2}$$

From equation 2, Y_t is the sector specific RGDP, u is the error term; β_0 is the intercept while β_1 and β_2 represent the slope coefficients of Interest rate and credit to the private sector variable ($INTR$ and CPS).

On a-priori, $\beta_1 < 0$ and $\beta_2 > 0$

To derive the impulse response function we specify equation 2 in its VAR modeling form expressed in equations 3, 4 and 5 respectively

$$INT_t = \alpha' + \sum_{j=1}^k \beta_j Y_{t-j} + \sum_{j=1}^k \delta_j INT_{t-j} + \sum_{j=1}^k \phi_j CPS_{t-j} + U2t \tag{3}$$

$$Y_{it} = \alpha + \sum_{j=1}^k \beta_j Y_{t-j} + \sum_{j=1}^k \delta_j INT_{t-j} + \sum_{j=1}^k \phi_j CPS_{t-j} + U1t \tag{4}$$

$$CPS_t = \alpha'' + \sum_{j=1}^k \beta_j Y_{t-j} + \sum_{j=1}^k \delta_j INT_{t-j} + \sum_{j=1}^k \phi_j CPS_{t-j} + U3t \tag{5}$$

Where the u 's in the equations are stochastic error terms, called impulses or shocks. Given that we utilized time series data, the variables were tested for the presence of unit roots with the aid of Augmented Dickey-Fuller (1981) unit root test procedure. In addition, the Granger (1969) granger causality tests how much of Y_t is explained by INT and CPS and vice versa.

RESULTS AND DISCUSSION

Before estimating the Vector Auto-Regression (VAR) model, the variables were tested for the presence of unit roots with the aid of the Augmented Dickey-Fuller and the Phillip-Perron unit root tests. The result of the unit root test is reported in Table 2 below. The result shows that agriculture, industry, building & construction, wholesale & retail trade, services, credit to the private sector and interest rate are non-stationary. In Table 1 the result shows the building and construction and credit to the private sector variables were not stationary at levels. However, when Phillip-Perron unit root tests were applied, all the variables became stationary at their individual levels.

Table 1: Unit Root Test for the Variables

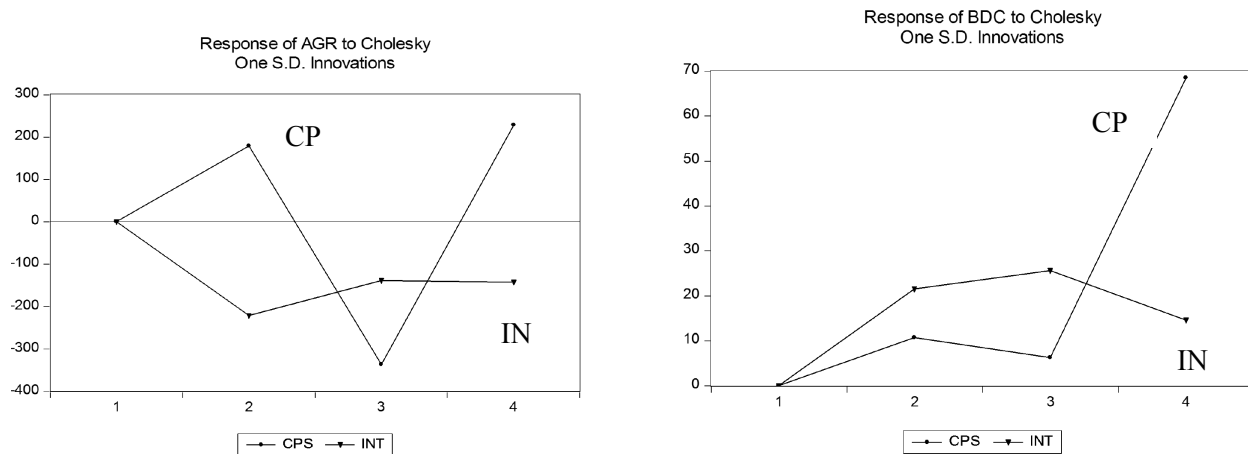
Variables	ADF Test Statistics	Status	PP Test Statistics	Status
AGR	-7.472 (0.000)***	I(1)	-21.752 (0.000)***	I(1)
IND	-6.235 (0.000)***	I(1)	-27.074 (0.000)***	I(1)
BDS	-2.424 (0.137)	I(0)	-14.707 (0.000)***	I(1)
SER	-3.137 (0.026)***	I(1)	-13.035 (0.000)***	I(1)
WRT	-1.550 (0.505)**	I(1)	-19.943 (0.000)***	I(1)
CRP	-1.864 (0.348)	I(0)	-9.656 (0.000)***	I(1)
INT	-8.753 (0.000)***	I(1)	-13.525 (0.000)***	I(1)

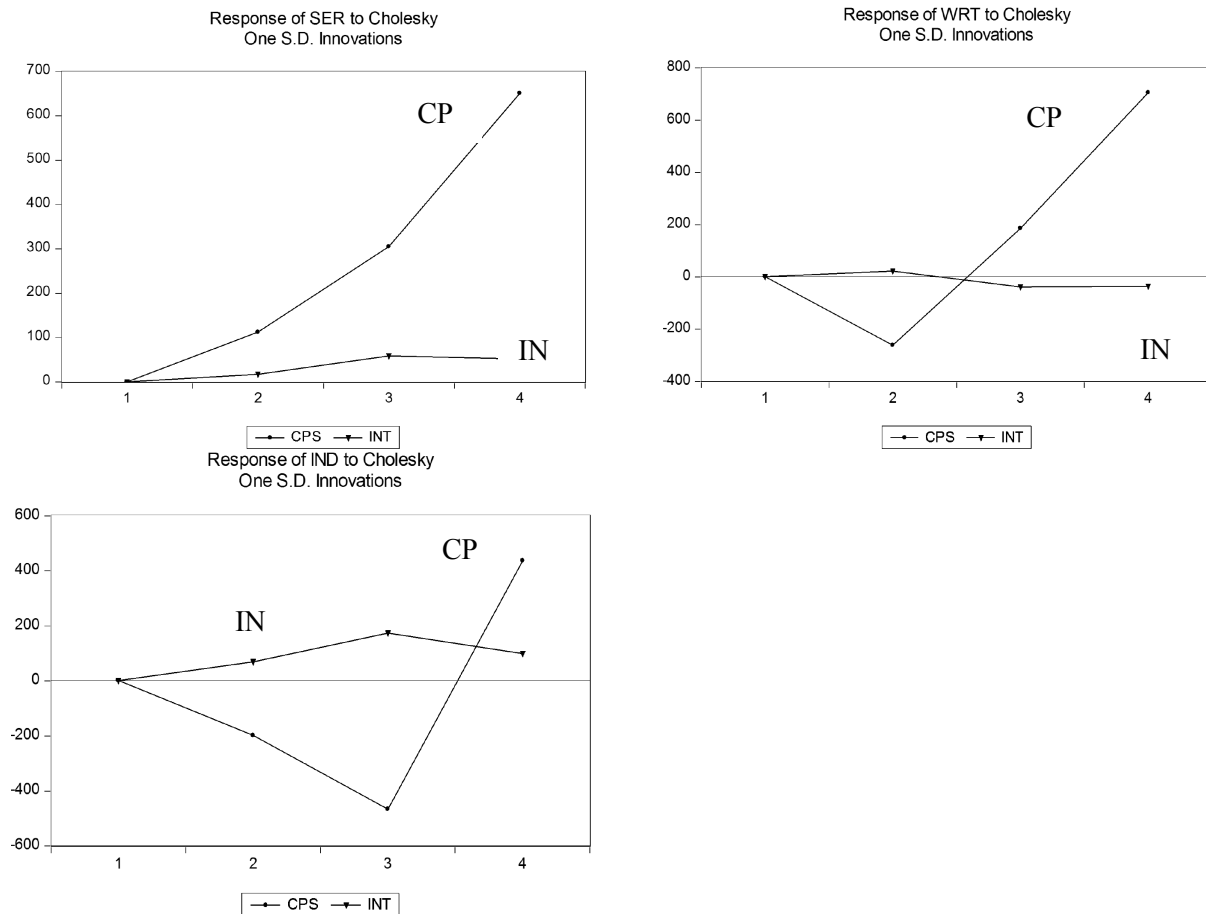
Note: AGRQ= Agriculture Output, INDQ = Industry Output, BDCQ = Building & Construction Output, WRTQ= Wholesale & Retail Trade Output, SERQ = Service Sector Output, CPS = Credit to the Private Sector, INTR = interest Rate. This table shows the results of the Augmented Dickey-Fuller (ADF) Unit Root test, which indicate that the level of each variables are integrated or stationary at their individual levels. The figures in parenthesis are the respective probability values while the symbol ** and *** indicates significance at 5 percent and 1 percent level.

Impulse Response Functions

Given that all the variables were found to be integrated of order one using the Phillip-Perron unit root tests, we proceeded to estimating the VAR models in equations 3, 4 and 5. Given that the aim of the study is to test the interest rate and credit sensitivity of sectoral output, we do not report the result of the VAR model here, but do use the result to generate the impulse response function. Figure 2 shows how the various sectors respond to shocks triggered by either interest rate or changes in credit to the private sector. Beginning with the agricultural sector output, a rise in credit, holding other variables constant, cause an increase in real agric output over the course of the first quarter. The upward trend in agricultural sector output is cut short at the end of the first quarter where it begins to decelerate over the second quarter due to the fading off of the effect of the shock. It accelerates and become positive again during the third and the fourth quarters.

Figure 2: Impulse Response Functions of the Sectors to Credit and Interest Rates





This figure shows the impulse response functions of all the five sectors of the Nigerian economy to credit and interest rate changes. It portrays the reaction of the five sectors as a function of credit and interest rate, parameterizing the dynamic behavior of the sectors.

From the same chart, it can be easily seen that interest rate shocks produced a persistent negative impact on agricultural sector output. One explanation to the positive effect of credits to agricultural sector output in the first quarter and third quarter is that these two periods accounts for the planting season and harvest season respectively. The response of Building and Construction output to interest rate and credit shocks produced a similar upward impact with that of the agricultural sector output in the first quarter through to the third quarter. However, the response of Building and Construction output to interest rate shocks appeared to be greater than the shock from credit in the same time period. Interestingly, from the third quarter the sector responded positively to credit shocks and negatively to interest rate shocks respectively.

The response of the service sector output to interest rate and credit shocks produced an interesting pattern. Service sector output responds positively almost immediately to an increase in credit to the private sector but is relatively insensitive to shocks emanating from a rise in interest rate over the four quarters. The implication of this is that a change in monetary policy rate by the Central Bank of Nigeria may not have any significant impact on the service sector output. The result for the Wholesale and Retail Trade sector shows that it takes approximately between two to three quarters for the sector to respond positively to an increase in credit to the private sector while the response of the sector to interest rate changes is relatively flat. Finally, the result of industrial sector output shows that it takes approximately three quarters for the sector to respond accordingly to changes in credit to the private sector and interest rate. For the industrial sector, output initially decreases for the first two quarters in response to an increase in the credit to the private sector. However, all other sectors remaining constant but by the third quarter, the sector begins to respond positively to credit shocks. Interest rate shocks have a negative impact on Industry only after the

third quarter. The results of the impulse response function are in accordance with the result obtained by Pellényi (2006) and Nwosa and Saibu (2012). While Pellényi (2006), found each sector in the Hungarian economy respond differently to monetary shocks, the result obtained by Nwosa and Saibu (2012) shows that the channels through which monetary policies were transmitted to various sectors in Nigeria were different. On the one hand, none of the sectors responds significantly to changes in interest rate, on the other hand, all the sectors are sensitive to changes in credit.

Granger Causality Tests

To test for causality as pioneered by Granger (1969) test is employed. It provides an evaluation in terms of which variable causes the other. The Granger causality tests affirmed our findings from the impulse response function. From Table 2, the result of the Granger causality test shows the existence of a unidirectional significant relationship between credits to the private sector and the five major sectors of the Nigerian economy. This is shown by significant F-statistic values of the various variables in Table 2. One sector that stands out in terms of its relations to credit is the building and construction sector which exhibits a bi-directional relationship with credit to the private sector. With the exception of building and construction sector, the result shows interest rate does not granger cause sectoral growth. The interesting finding of this study is that sectoral credit allocation is an important tool in influencing and controlling the Nigerian economy.

Table 2: Pairwise Granger Causality Tests

Null Hypothesis	Obs.	F-Statistic	Prob.
CPS does not Granger Cause AGR	129	5.6177	0.0012
AGR does not Granger Cause CPS		0.9410	0.4231
INT does not Granger Cause AGR	129	0.1850	0.9065
AGR does not Granger Cause INT		0.0035	0.9997
INT does not Granger Cause CPS	129	2.8666	0.0394
CPS does not Granger Cause INT		2.3991	0.0712
CPS does not Granger Cause BDC	129	11.3541	0.0000
BDC does not Granger Cause CPS		2.1090	0.1026
INT does not Granger Cause BDC	129	4.2056	0.0072
BDC does not Granger Cause INT		0.3117	0.8169
CPS does not Granger Cause IND	129	5.9399	0.0008
IND does not Granger Cause CPS		2.3374	0.0770
INT does not Granger Cause IND	129	0.4626	0.7089
IND does not Granger Cause INT		0.0449	0.9873
CPS does not Granger Cause SER	129	2.8962	0.0380
SER does not Granger Cause CPS		1.0704	0.3643
INT does not Granger Cause SER	129	1.8693	0.1383
SER does not Granger Cause INT		0.0900	0.9654
CPS does not Granger Cause WRT	129	3.3203	0.0221
WRT does not Granger Cause CPS		1.5057	0.2165
INT does not Granger Cause WRT	129	0.0900	0.9654
WRT does not Granger Cause INT		0.0837	0.9688

*This table suggests that Credit is an important source of variation to sectoral growth in Nigeria. On the other hand, interest rate does not granger cause sectoral growth. *** and ** denote rejection of the null hypothesis at the 1 and 5 per cent level.*

CONCLUDING COMMENTS

This study set out to examine interest rate and credit sensitivity of sectoral output in Nigeria over the period 1990: Q1 to 2012: Q4. The study made use of the granger causality test and the impulse response function to determine the relative sensitivity of the aggregated five sectors to changes in interest rate and credit to the private sector. The result obtained from the study shows that sectoral output is sensitive to Credit allocation but not to interest rate. In other words, the five sectors of the economy are very sensitive to credit allocations. Therefore, Credit is a useful tool for boosting sectoral output growth in Nigeria. A major tool that the Central Bank uses to control the movement of macroeconomic aggregates is the variation in the

stock of money and interest rate. The insensitivity of sectoral output to changes in interest rates suggests that monetary policy is largely ineffective in influencing sector growth in Nigeria. This finding suggests a mix of monetary and fiscal policy to achieve the desired goals of monetary authority in Nigeria. It is worth mentioning that for government financing policies to achieve the targets for sectoral development, Nigeria will need an ample quantum of purposefully targeted investments in all the sectors to improve infrastructure, augment productivity, and intensify competitiveness of small and medium-scale enterprises. In this paper, we aggregated and assumed only five sectors and tracked the behavior of the five sectors in relation to aggregate credit to the private sector. Further research might examine broader sectors of the Nigeria economy and the relative credit allocated to the specific sectors of the Nigeria economy. This might necessitate the use of a dynamic panel data analysis to capture the random effect and the fixed effects associated with the various sectors of the Nigeria economy as they react to changes in interest rate and credit.

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