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IMPACT OF CREDIT CHANNEL OF MONETARY POLICY TRANSMISSION MECHANISM ON THE NIGERIAN ECONOMY

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Abstract

This study is predicated on the long age debate among scholars and Theorists with respect to monetary policy transmission mechanism. Some schools of thought believe that money does not matter and monetary policy is ineffective in influencing real economic variables such as employment and real output. While other schools claim that money matters and monetary policy can influence real economic activities at least in the short run. The last school of thought is those in between these two opponents who believe that the link between money and output is actually reverse causation not the other way round. These controversies revolve on the issue of ascertaining the channel of transmitting monetary policy actions into the economy. Therefore, using the Vector Autoregressive (VAR) Model, this study sought to empirically analyze credit channel of monetary policy transmission mechanism in Nigeria. Applying the time series data spanning the periods of 56 years 1960-2016, the empirical analysis found four interesting results as follows: firstly, all the credit channels variables were non stationary at levels but appears stationary at first difference. Secondly, there is a short run link between credit channel and Nigeria economic growth. Thirdly, there exists a long run equilibrium relationship between credit channel and economic growth in Nigeria. Fourthly, there is evidence of causality running from credit channel to economic growth in Nigeria. Thus, the study came out with one stylized fact about monetary policy transmission mechanism in Nigeria as follows: that the credit channel of monetary policy transmission mechanism are fully effective, operational and promote economic activities in Nigeria and that the effective propagation of monetary policy in Nigeria are done through the credit channel. Based on the findings above, the study recommends that the policy approach of encouraging, emphasizing and arousing the good management of credit channel of the transmission mechanism in Nigeria should be vigorously pursued. This has the ability to trigger up growth in various sectors of the Nigerian economy.

Keywords: *Credit Channel, Monetary Policy, Transmission Mechanism, Economic Growth.*

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1. Introduction

There is a heated debate among scholars with respect to monetary policy transmission mechanism, with the issue of identifying which channel of transmitting monetary policy actions in Nigeria is still unresolved. For some period now say 2010 to 2016, the credit channel of monetary transmission (credit to private sector) recorded a growth of -4.1% for (2010), 44.3% for (2011), 6.8% for (2012), 6.9% for (2013), 11.9% for (2014), 3.29% for (2015) and 19.37% for (2016) as against the projection of 32% for (2010), 29.1% for (2011), 47.5% for (2012), 17.5% for (2013), 15.85% for (2014), 26.06 for (2015) and 27.05% for (2016) respectively. This instability in the growth rate of credit was as a result of slum in general economic activities caused by the threat to global financial stability and the consequent monetary shocks which started in 2011, where the policy rate (MPR) was pegged at 12 percent and 13 percent towards the ends of 2013 and 2014 but later stood at 14% for 2015 and 2016 respectively. These were complimented by an upward review of the cash reserve requirement for both private and public sector deposit. These variances in monetary policy variables plays critical role in the effectiveness of monetary policy transmission in Nigeria. This is why Ononugbo (2012) assert that insufficient knowledge of the economic system could deter monetary policy transmission from having the desired effects while poor comprehension of the results of monetary policy would lead to misjudgment and extremely raise the costs of achieving policy goals while the uncertain nature of the transmission mechanism and poor understanding of the system has remained a major challenge for monetary policy (Uchendu, 2009).

In the light of the above, there are few empirical evidences on credit channel of transmission mechanism of monetary policy in Nigeria. The works of Jimoh, 1990; Uchendu, 1996; Oke, 1995; Ojo, 2000; Nnnana, 2001; Adebiyi, 2006; Ajayi, 2007; Mbutor, 2009; Chuku, 2009; Onyaromade, 2011, Nwosa and Saibu, 2012, Ndukwe, (2013), Hassan, (2015) and Obafemi and Ifere, (2015) have studied the credit channel of monetary policy transmission mechanism from both theoretical and empirical perspectives with most of the study focusing on identifying the effectiveness or dominant channels of transmitting monetary policy actions. But to the best knowledge of the researcher none of these studies in Nigeria have empirically studied the true nature of the relationship between credit channel of monetary policy transmission and economic growth in Nigeria. As such this study helps to bridge the gap and to find a new perspective by analyzing the relative relationship between credit channel of monetary policy transmission mechanism and economic growth of the biggest African county: Nigeria.

2. Theoretical and Empirical Review

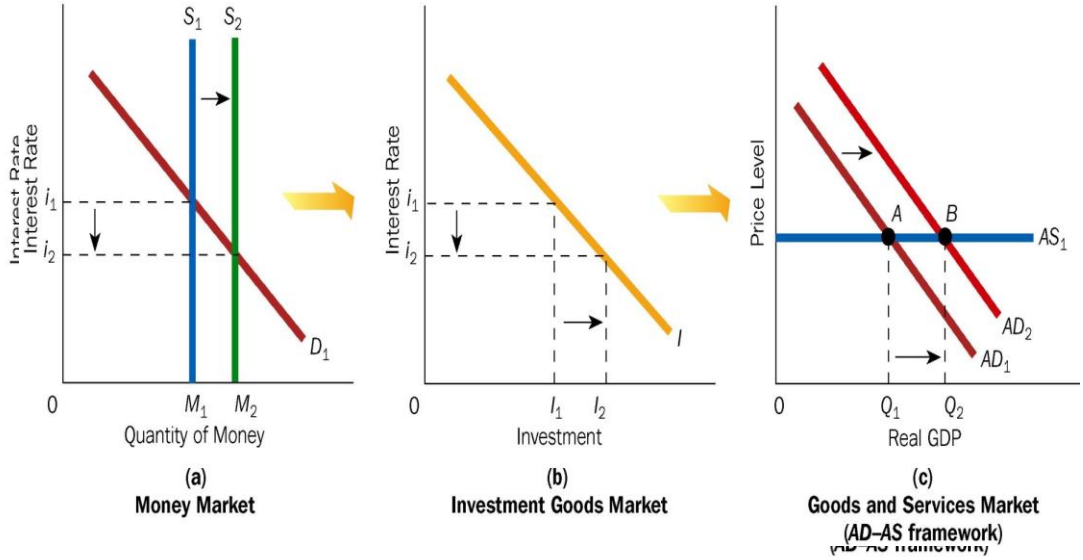
2.1. The Keynesian Theory

The transmission mechanism in the Keynesian theory is indirect via the interest rate. In the Keynesian transmission mechanism, changes in the money supply affect aggregate expenditure, output, employment and income indirectly through changes in the interest rate (Keynes, 1936 and Ezirim, 2005). Assume the central bank increase the money supply by open market purchase of government bonds; it lowers the interest rate which in turn increases investment and expenditure, thereby raising the national income. The mechanism by which changes in the money supply are transmitted into the income level is called the asset effect. With income level unchanged when the money supply is increased, it causes economic agent to spend their excess holdings of money on bonds. This means an increase in the demand for bonds and a rise in their prices. A rise in the prices of bonds brings down the money interest rate. This, in turn, increases the speculative demand for money. Economic agents prefer to keep money in cash rather than lend it at a low interest rate. This is called the liquidity effect. This is the first stage in the Keynesian transmission mechanism. In the next stage, the fall in the interest rate and an increase in the speculative demand for money stimulate investment. Businessmen prefer to invest in capital goods rather than hold money in cash for speculative purposes. The Keynesian transmission mechanism consisting of three stages is called the cost of capital channel and is summarized thus:

$$\uparrow \textit{Money} \rightarrow \textit{Interest Rate}\downarrow \rightarrow \textit{Investment} \uparrow \rightarrow \textit{Income}\uparrow$$

where the increase in the money supply leads to interest rate falls, investment and income rise. The rise in price level raises nominal income that leads to an increase in the transactions and precautionary demand for money, thereby bringing a feedback effect on the economy. The increase in transactions and precautionary balances, in turn, reduces the speculative balances. The latter raise the interest rate, and bring a fall in investment and income and lead to a further feedback effect called the income effect (Friedman 1956, 1959, 1969). Furthermore, the Keynesian transmission mechanism is explained in Graph 1 below.

Graph 1: The Keynesian Transmission Mechanism



This is how the effects of an increase in the money supply are transmitted in the real variables of the economy under the Keynesian transmission mechanism. The neutrality of money in the Keynesian system is theorized to relate to two major situations.

2.1.1. The Case of Liquidity Trap

When the economy is in liquidity trap, there cannot be a further fall in the rate of interest even if the money supply is increased by monetary authorities. There will be no effect on such real variables as investment and income and all changes in the money supply are added to idle balances. In this situation, money is neutral. Keynes himself accepts the weakness of this transmission mechanism when he explains the liquidity trap.

2.1.2. The Case of Full Employment

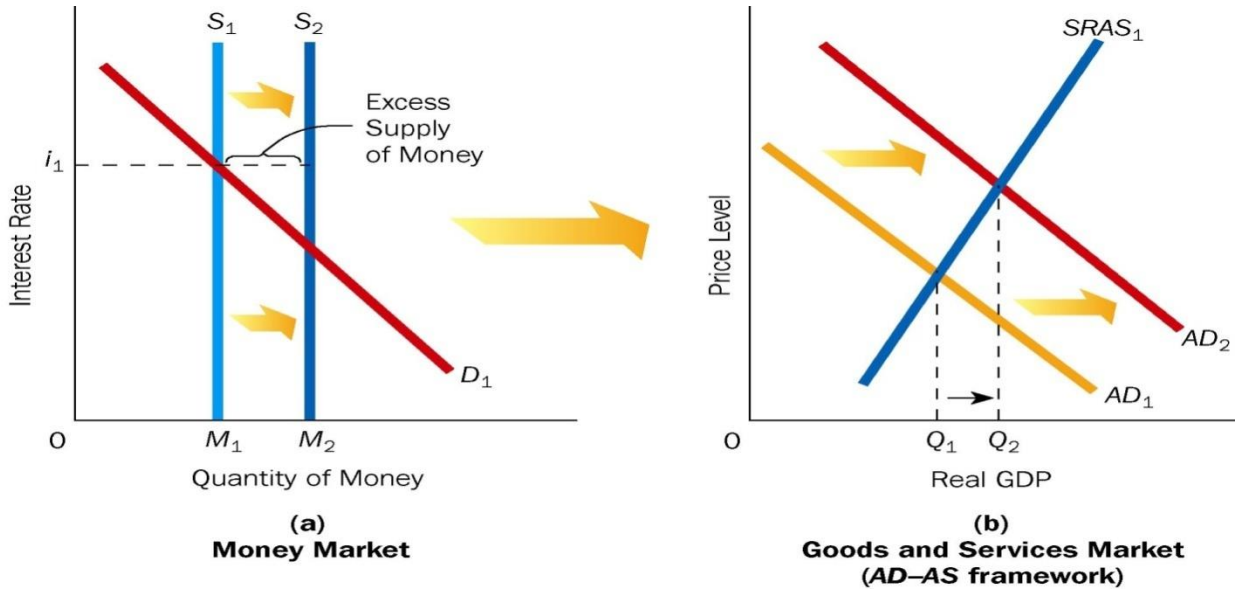
When any increase in the quantity of money bring about a proportionate increase in the price level but output remains unchanged at that same level. However, money is non-neutral in the intermediate case between these two extreme cases in the Keynesians systems, when there is unemployment; changes in the money supply produce permanent non-neutral effects on the rate of interest, the level of employment, income and output and rate of capital formation etc. For this reason Keynes (1930, 1936) emphasized non-neutral money by invoking his monetary theory of interest and stated that as soon as we pass to problem of what determines output and employment as a whole, we require the complete theory of monetary economy.

2.2. The Monetarist Theory

This school of thought of holds that changes in money supply cause changes in aggregate demand, (or expenditure), prices, interest rates and other economic variables is essentially portfolio adjustment process. The economy is composed of various economic agents (individuals, households and firms) who hold their wealth in the form of portfolio of assets. These assets are both financial and non-financial which include money, securities, durable and semi-durable goods and services etc. Any change in the money supply causes disequilibrium between the public's actual and desired real cash balances of assets in their portfolio. Assume the money supply is increased, this increases the cash balances with the public. Economic agents will reduce their excess cash balances by spending on a wide range of financial and non-financial assets like shares, bond, goods and services etc. In view of this, the monetarists have identified that monetary transmission mechanism influence the economy through the wealth channel and financial asset prices (Maina, 2015). Thus the channel of monetarist's mechanism is;

Money → Price → Interest Rate

Graph 2: Monetarist Transmission Mechanisms



With increase in the money supply, the M_1 curve shift to M_2. If the money demand remains constant, the interest rate would fall from OI to OI_1. The increased demand for financial and non-financial asset leads to an increase in output and prices so that the demand for money

increases at every interest rate. As a result, the AD_1 curve shifts upwards to AD_2 and the interest rate increases to OR_2.

2.3. The Neo-Keynesian Theory

This school of thought theorized the monetary transmission mechanism through the portfolio adjustment process it states that when the supply of money changes, it sets in motion wealth effect, substitution effects and availability effects. These channels of monetary mechanism are discussed asunder.

2.3.1. Wealth Effect

In the Keynesian analysis, no direct wealth effect is involved when the Central Bank engages in open market purchases of bonds or securities. It simply involves the transfer of money for bonds. But in the neo-Keynesian analysis, changes in the money supply affect the economy through wealth effect channels. The increase in the money supply through open market purchase of securities by the central bank increases consumer wealth which, in turn, leads to rise in consumer spending. The increased money supply lowers the interest rate and produces a wealth effect. As a result, the expected value of real capital assets increases and the asset holders feel wealthier. They buy more of all assets in the portfolio and thus increase their demand for capital non-durable goods which ultimately lead to increase in output, employment and income in the economy.

2.3.2. Substitution Effects

The neo-Keynesian widened considerably the portfolio of assets to include not only government securities but also industrial bonds, equities, savings, mortgages, etc, given this type of portfolio, suppose the central bank engages in open market purchases of securities. This will increase the prices of securities, thereby reducing the yield on them. In other words, the holders of securities sell them to the central bank because they get high prices for them. They now hold more money than they desire. As a result, they try to readjust the structure of their portfolios so as to reduce their money holdings. Assume they substitute bonds for their excess money balances. The increase in the demand for bonds result in an increase in their market price, thereby reducing their current yield as interest rate falls. Consequently, the demand for other assets such as equities, consumer durables, etc increases when people purchase equities (shares), their prices rise. As a result, the value of capital of such forms rises above the supply

price of such new capital. Such firms are therefore, induced to increase their demand for more capital equipment, thereby raising output in the capital goods industries. This will, in turn, spread to the rest of the economy via the multiplier effect. Thus the "neo-Keynesians contend that financial assets are the closest. Substitutes for money and that, consequently increase in the supply of money will have their effect eventually on the level of economic activity by bringing about increase in the output of capital goods industries.

2.3.3. Credit Availability Effects

The credit availability effects relates to the transmission mechanism following effects of changes in the interest rate on banks and financial institutions. Banks and other financial institutions which advance loans private borrowers charge a standard interest rate and resort to non-price credit rationing depending on the status, credit worthiness and wealth of borrowers. The non-price rationing of credit is also due to the absence of a market cleaning interest rate. Non-price credit rationing lead's to "lock-in" effect. Both these are called credit availability effects.

Assume the central bank increases the money supply by purchasing government securities. This increases the money supply with the banks. Consequently, the reserves of banks increase in bank credit. This leads to a fall in interest rates. The banks will reduce credit rationing and make more credit available to their consumers. At the same time, they will not "lock-in" securities in their portfolio because the prices of the securities rise in the market with a fall in interest rates. They will, therefore, prefer to sell them to have more capital gain. Thus they use these additional funds for advancing more loans. If, however, the interest rate charged on banks loans is very low in relation to the interest rate earned by the banks on other assets in their portfolios, the banks may continue with credit rationing. If there is free competition among financial and non-financial lending institutions, credit rationing will be a temporary phenomenon. Further, if the funds are being advanced by non-bank financial institutions such as a building society, the banks may continue credit rationing due to the absence of market clearing interest rate. Interest rate may also be slow to adjust or they may continue to be administered by the non-bank financial institution. In all such cases, banks may resort to credit rationing. Finally, when the wealth effects substitution effects and credit availability effects operate through an increase in the money supply, their initial impacts leads to additional income which in turn, will expand the demand for consumer on-durable and durable goods and services

and ultimately to increase in output and employment. The opposite will happen when the money supply is decreased.

2.4. Empirical Evidence

In this section, the previous works of scholars supporting the interest rate channel as the mechanism through which monetary policy actions is transmitted into the economy will be review across countries. The early empirical work on credit channel was pioneered by Bernanke (1986) in US. Using the structural VAR approach, the result found that credit shocks are important for output in US. Oliner and Rudebusch (1996) arrived at similar results in their study of 7000 US manufacturing, mining, and trade corporations over 1973-1991 using quarterly data. Based on the calculation of impulse response functions using VAR they concluded that monetary contraction led to more credit being channeled to large firms. The first study researching the channel of bank credits of Turkey belongs to Yülek (1998). In this study, via the monthly data covering the period 1986 -1994, and VAR Model and the functions of cause–effect, the conclusions that are consistent with credit channel were reached. Arcangelis and Giorgio (1999) presented the results supporting the presence of channel of bank credits for Italy, Garretsen and Swank (1998) for Netherland, and Iturriaga (2000) for 20 OECD countries. De Bond (1999), in the study he carried out for Euro region (Germany, Italy, France, Netherlands, United Kingdom, and Belgium); the results were reached about the presence of credit channel in these countries except for United Kingdom, and Belgium. In Malaysia, Azali and Matthews (1999) studied monetary transmission mechanism and found that before the liberalization periods that bank credit channel was responsible for economic development, while the interest rate and credit channels dominated the period after liberalization.

Kashyap and Stein (2000) opt for a two step flexible specification procedures and run a cross sectional regression at the first stage and bivariate regression in the second stage, based on quarterly time series data running from 1976Q1 to 1993Q4. They found that bank lending channel is stronger for banks with less liquid assets. Their findings lend empirical support for the presence of the bank lending channel in USA. In Japan, Morsink and Bayoumi (2001) using the VAR model and adjusted quarterly time series data from 1993Q1 to 1998Q3 lagged by two. It was found that both money channel and bank lending channel plays an important role in transmitting monetary shocks to economic activities.

The following works of Kishan and Opiela, (2000); Kashyap and Stein, (2000); Huang, (2003) and Sichei, (2005) also favored the bank lending sub-channel, as changes in monetary base influence banks' ability to make loans. In Zambia, the works of Simatele (2004), Mutoti (2006), and Baldini et al, (2012) also supported the presence of the credit channels in Zambia. For Chile, Alfaro et al. (2003) employed the estimate of VAR to test for significance of Bank lending channel using data from 1990 to 2002. The study concludes that bank lending channel has significant impact on aggregate output. Disyatat and Vongsinsirikul (2003) examine monetary policy transmission mechanism over the period of 1993Q1-2001Q4 using VAR methodology. They found bank lending channel playing the important role in the conduct of monetary policy in Thailand.

In related research carried out in Trinidad and Tobago by Ramlogan (2007). The findings of the structural VAR analysis shows that the credit channel is more important than the interest rate channel in transmitting impulse from the financial sector to the real sector. Çi (2007) results found that the credit channel is becoming increasingly important in influencing economic activities in Turkey. The work of Catao and Pagan (2010) used the expectation-augmented SVAR and conclude that bank credit channel plays an important role Brazil and Chile. Aleem (2010) employs VAR approach in investigating the transmission mechanisms of monetary policy in India. The results reveal that the bank lending channel plays a very vital role in transmitting the innovations of the monetary policy to the economy.

Wulandari (2012) used the structural vector auto regression (SVAR) model in assessing the important roles of credit channel and interest rate channel in managing inflation and economic growth in Indonesia. The result shows that credit channel effectively affect economic growth in Indonesia. Ishioro, (2013) employed the granger causality test to examine the channels of monetary transmission mechanism in Nigeria. The result shows that the credit channel is functional in Nigeria. Similarly the work of Ndekwe (2013) found that the credit channel gives the greatest effect in the way monetary policy is transmitted in the Nigeria economy. Chileshe et al., (2014) employed the autoregressive methods to empirically identify the impact of monetary policy on macroeconomic outcomes in Zambia. The results indicate that the direct link between credit channel (monetary aggregate) and macroeconomic outcomes is stronger than that of interest rate channel. Obafemi and Ifere, (2015) investigated the mixed evidence on the effectiveness of monetary policy transmission by exploring the quarterly data of the period 1970 to 2013. Their findings also favored the credit channel as also a dominant and strongest channel of transmitting

monetary policy shocks in Nigeria. Ngerebo-A (2016) study examined the effectiveness of monetary policy in controlling inflation in Nigeria for the period 1985-2012. The results reports that credit to both private and government sector explains the changes witness in the inflation rate in Nigeria while monetary policy rate treasury bill rate and Maximum lending rate do not account for changes in inflation rate. Essien et al (2016) using the VAR framework to examine the link between monetary policy and unemployment in Nigeria. It was found that positive shock to policy rate increases unemployment over a 10 quarter period. Omini, et al (2017) examined the impact of monetary policy shocks on output of industrial sector, using the VECM and granger causality test to analyzed the data for the period of 45years (1970-2015). The result shows that industrial output of Nigeria manufacturing subsector responds positively to shocks in credit channel.

3. Methodology

3.1. Data

The data are time series in nature. That is secondary data obtained from the publications of the Central Bank of Nigeria statistical bulletin 2016. Data were collected for the period of 1960 to 2016 (56 years) on economic growth (Real GDP) which is the criterion variable and deposit money bank credits to the private (CPS), credit to the government (CGO), credit to small and medium enterprises (CSM), and net domestic credit to the Nigeria economy (NDC) as proxies for credit.

3.2. Estimation Techniques

The study conducted preliminary analysis, descriptive statistical analysis and econometric analysis. For the preliminary analysis, the unit root test will be used to investigate the stationarity of the variables as non stationarity could lead to spurious regression results. Such spurious relationship between/among variables may be evident in time series data that exhibit non stationary. Thereafter, the descriptive statistics analysis was carried out to ascertain the true behavior of the variables of study. The study utilizes such measures as the mean, median, standard deviations, skewness and kurtosis, and the Jarque-Bera statistic. Furthermore, the study makes elaborate use of graphical analytical techniques such as line graphs, histogram and stacked bar charts, among others. However, the VAR model will be adopted as the estimation technique of the study. Johansen multivariate co-integration test would be applied to determine the long run

equilibrium of the variables in the model, while the Granger Causality Test would also be applied in checking the underlying structure of the dynamics relationship between the variables.

3.3. Model Specification

Leaning on theoretical models and previous empirical works of Chileshe et al (2014), we model the credit channel of monetary policy transmission mechanism in the form of the following algebraic expression:

$$RGDP_t = f(CPS_t, CGO_t, NDC_t, CSM_t,) \quad (1)$$

We can rewrite the model of credit channel of monetary policy transmission derived from equation (1) to have the estimable version of equation (2)

$$RGDP_t = \alpha_0 + \beta_1 CPS_t + \beta_2 CGO_t + \beta_3 NDC_t + \beta_4 CSM_t + \mu \quad (2)$$

$$= \alpha_0 + \sum_{i=0}^{n} \beta_{1,} + E_{it;}\, \beta_i \geq 0 \quad (3)$$

Where

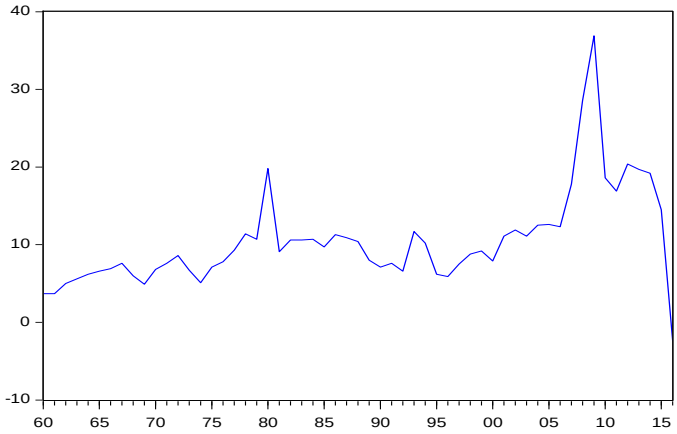
RGDP = Real Gross Domestic Product Growth Rate
CPS = Credit Private Sector
CGO = Credit to the Government
NDC = Net Domestic Credit to the Economy
CSM = Credit to Small and Medium Enterprises
α_0 = Constant / Intercept
β_1- β_4 = Coefficients of independent variables
μ_{it} = Error Term

4. Results and Discussions

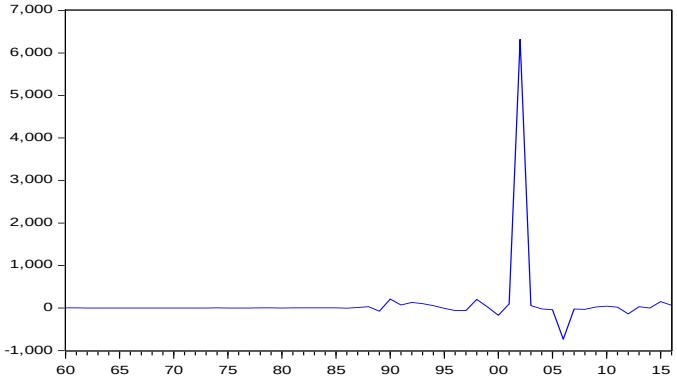
4.1. Trend Analysis on Interest rate Channel and Economic Output

Clearly, all the variables of the credit channel of monetary policy transmission mechanism exhibit trend terms.

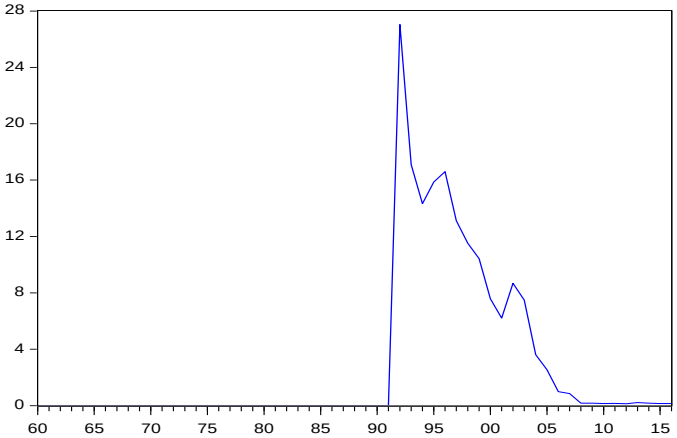
Graph 3: Credit Private to Sector



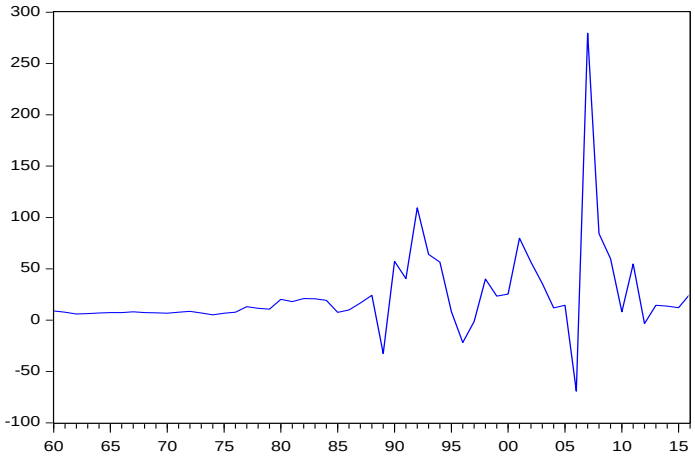
Graph 4: Credits to the Government



Graph 5: Credits to Small and Medium Enterprises



Graph 6: Net Domestic Credits to the Economy



Graph 3 shows the growth in credit to the private sector (CPS) and from this Graph it maintained a rising trend throughout the period under review. In 1960 the growth in CPS was 3.7%, it rose to 6.8% in the year 1970. It further increased to 19.8% in 1980. It declined to 7.1%, later it increased to 7.9% and 18.6% in 2000 and 2010 respectively. Furthermore in 2012 it rose to 20.4% however, growth in CPS dipped to an all-time low of -2.4% in 2016. Also Graph 4 shown above reveals that growth in credit to the government maintained a rising trend with a major peak in 2002 and a trough in 2006. From 1960 to 1985 growth in credit to the government stood between 0.5% - 7%, later it rose astronomically to 6320.55% in 2002. It later declined to 138.04% in 2012 and stood at 66.22% in 2016. Similiarly, as shown in Graph 4, growth in credit to SMEs between 1992 to 2016 maintained a decreasing trend. In 1992, growth in credit to SMEs stood at 27.04% while in 2000 it declined to 7.58%. Between 1992-2005 credit to SMEs stood between 2% - 28%. This is because the period falls within the time government directed banks in the country to mandatorily allocate 20 percent of their total credit to SMEs. However, in 1996 or thereabout, the mandatory credit allocation was abolished and this explained the downward trend of credit to SMEs. Despite, the clamour by stakeholders to promote SMEs development via credit extension, credit to this sub sector has remained very poor. Evidently, growth in credit to SMEs decline from 2.54% to 0.2% in 2016. Finally,growth in net domestic credits to the economy as shown in Graph 6 maintained an increasing trend. NDC rose from 8.88% in 1960 to 20.13% in 1980. It later it increased to 57.30% in 1990 and decline to 25.32% in 2000. In 2007, NDC rose to 279.44% but stood at 25.64% in 2016.

4.2. Stationarity Test

Table 1: Unit Root Test for Credit Channel

	D(RGDP)	D(CPS)	D(CGO)	D(CSM)	D(NDC)
ADF Statistics	-7.727133	-6.479150	-12.16586	-9.453190	-13.03563
1%	-3.555023	-3.555023	-3.555023	-3.555023	-3.555023
5%	-2.915522	-2.915522	-2.915522	-2.915522	-2.915522
10%	-2.595562	-2.595562	-2.595562	-2.595562	-2.595562
Probability	0.0000	0.0000	0.0000	0.0000	0.0000

Source: E-view 9.0 Output

Table 1 displayy the ADF unit root test result for credit channel, from the result it is clear that all the variables of the credit channel are not stationary at levels but appears stationary at first difference. Thus, the series are all integrated serious of order I(1). This is evidence by the fact that the absolute values of the ADF test statistics are all greater than the MacKinnon critical values at 1%, 5% and 10% level of significance and thus the respective null hypotheses of non-stationarity are rejected, implying the absence of unit roots among the variables.

4.3. Descriptive Analysis

Table 2: Descriptive Statistics Results for Credit Channel

	RGDP	CPS	CGO	CSM	NDC
Mean	8.291579	10.50526	111.8898	2.902105	23.90614
Median	6.000000	9.200000	2.660000	0.000000	11.99000
Maximum	39.90000	36.90000	6320.550	27.04000	279.4400
Minimum	-15.74000	-2.400000	-732.7400	0.000000	-69.12000

Std. Dev.	10.23828	6.233963	845.1877	5.883528	44.18280
Skewness	1.319295	1.823502	7.120333	2.188578	3.496411
Kurtosis	5.171793	8.066583	52.94588	7.358537	21.18230
Jarque-Bera	27.73725	92.55589	6406.296	90.62132	901.3020
Probability	0.000001	0.000000	0.000000	0.000000	0.000000
Observations	57	57	57	57	57

Source: E-view 9.0 Output

From table 2 of chapter four, the Real GDP has the lowest mean value of 8.291579 while credit to the government (CGO) has the highest mean value of 111.8898. Furnished with this descriptive analysis is the skewness and kurtosis of all the variables concern. Knowing that the symmetrical property of the histogram is measured using skewness and the kurtosis measures the height and tail shape of the histogram. The standard for measuring the skewness is how closer is the variable to zero (0) while for the kurtosis how closer is the variable to three (3). Therefore, RGDP, CPS, CGO, CSM and NDC have asymmetrical distributions. For kurtosis, all variables are peak (leptokurtic) in nature. The Jarque-Bera statistic which is a test statistic for testing whether the series is normally distributed, measuring the difference of the skewness and kurtosis of the series with those from the normal distribution is reported at 27.7 with a probability of 0.00001 for RGDP,. It reported 92.6 with a probability of 0.000000 for CPS, 6406.3 with a probability of 0.000000 for CGO, 90.6 with a probability of 0.000000 for CSM and 901.3 with a probability of 0.00000 for NDC. Under the null hypothesis of a normal distribution, the reported probability indicates that we can accept the hypothesis of normal distribution at 5% level of significance.

4.4. Econometric Analysis

Table 3 Vector Autoregression Estimates for Credit Channel

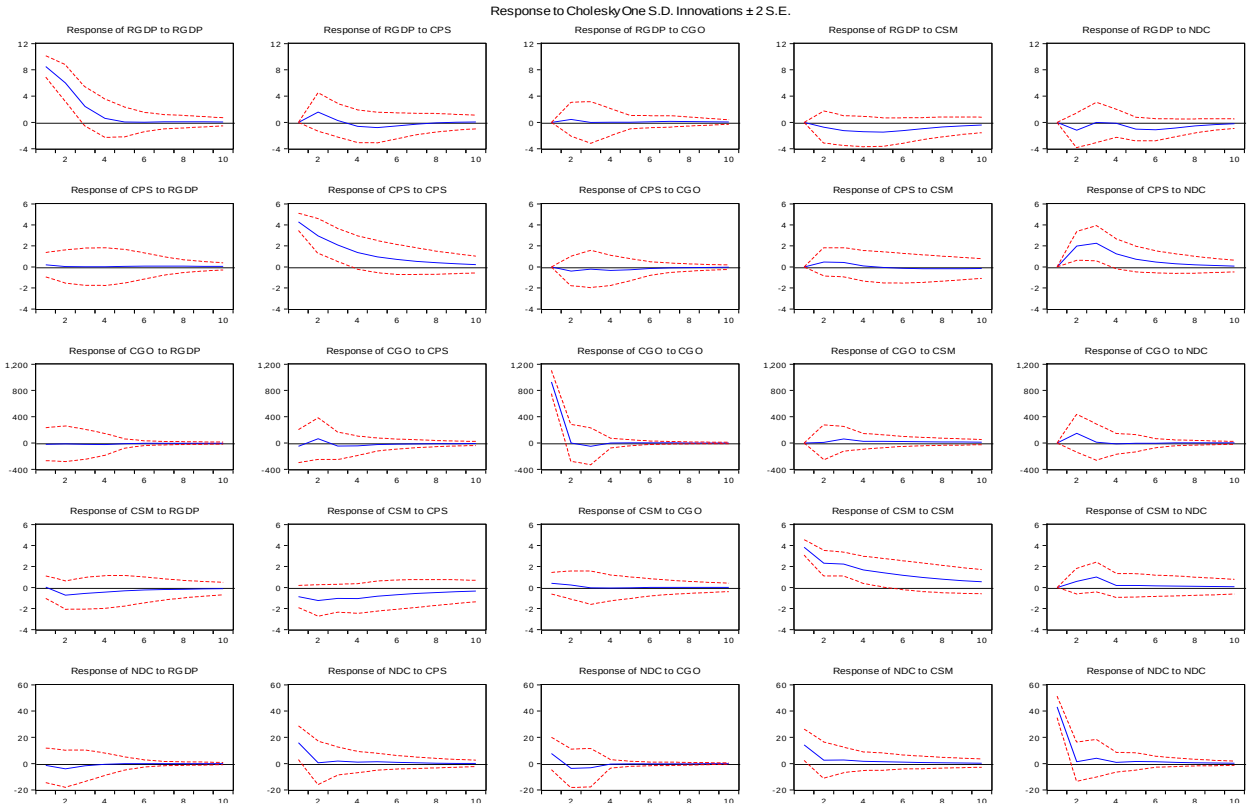
	RGDP	CPS	CGO	CSM	NDC
Lag 1	0.690180	0.459879	0.000762	-0.082126	-0.028012
	(0.14350)	(3.37930)	(0.00140)	(0.33406)	(0.03041)
	[4.80973]	[1.21243]	[2.54544]	[-0.24584]	[-0.92120]
Lag 2	-0.209061	-0.554997	-0.000158	-0.176417	-0.003029
	(0.14368)	(3.11615)	(0.00139)	(0.31351)	(0.03262)
	[-1.45503]	[-1.75550]	[-0.11419]	[-0.56271]	[-0.09283]
Constant	6.812128	3.663073	144.7818	2.308926	18.19970
	(3.20003)	(1.61279)	(349.812)	(1.48328)	(18.3108)
	[2.12877]	[2.27126]	[0.41388]	[1.55663]	[0.99393]
R-squared	0.783486				
Adj. R-squared	0.667005				
F-statistic	13.50635				
Log likelihood	-189.6974				
Akaike AIC	7.298088				
Schwarz SC	7.699555				

Source: E-view 9.0 Output

From our result thus far, the global statistics indicates that the forecasting and predictive power of the model as specified was quite high. We can thus rely on the relative results to make inference on the relationship between the variables of study. The VAR results of the relative statistics are summarized on table 3 above. It can be seen that the parameter estimate for growth in credit to the private sector (CPS) has a short run positive and significant relationship with Real GDP at lag 1. It turned negative at lag 2. The variable recorded a coefficient 0.459879 and -0.554997 with a standard error of 0.37930 & 0.31615 at t-value of 3.21243 and 3.15550 respectively.

Similarly, the coefficient estimate for growth in credit to the government (CGO) also had short run positive relationship with Real GDP. This is statistically significant at lag 1 but turned negative when it was lagged 2. CGO as a variable of the credit channel recorded a coefficient of 0.000762 and -0.000158 at both lag 1 and 2. The standard error stood at 0.00140 and 0.00139 with a t-statistics of 0.54544 and -0.24584 for both lag. Also, the parameter estimate for growth in credit to SMEs (CSM) has a negative short run relationship with Real GDP when lagged at period 1 and 2. CSM recorded a coefficient of -0.082126 and -0.176417, a standard error of 0.33406 and 0.31351 and a t-value of -0.24584 and -0.56271. Again, a cursory look at table 4.19 reveals that the coefficient net domestic credit to the economy (NDC) have a negative short run relationship with Real GDP when lagged either once or twice. NDC recorded a coefficient of -0.176417 and -0.028012 with a standard error of 0.03041 and 0.03262 and t- value of -0.92120 and -0.09283 respectively. However, the observed degree of relationship between the variables of credit channel and economic growth was quite high at an adjusted R squared of 0.667. By implication, about 67% of the variations in Real GDP were explained by changes in credit channel variables. This demonstrates a good fit as indicated by the F- statistic of 13.506. The log likelihood ratio, Akaike information criterion and Schwarz Bayesian criterion statistic all showed that the model has good forecasting power. Thus the credit channel of monetary policy transmission mechanism has short run relationship with Real GDP. Therefore, the null hypothesis of no significant short run relationship cannot be accepted in place of the alternative hypothesis.

Graph 7: Impulse Response Functions for Credit Channel



We conducted an impulse response functions analysis of Real GDP to credit channel variables and credit channel variables (CPS, CGO, CSM, and NDC) to Real GDP for periods of 10 years as depicted in Graph 7 above. The IRFs traces out the response of current and future value of variables to a shock reaction. The IRFs Graph above shows ten (10) periods of how the variables react to or response to one another when one standard error shock is given in the residual. From Graph 7, RGDP responds to a one standard error shock is positive but completely leveled out within the baseline of zero. The impulse response functions of real GDP to credit to private sector (CPS) shows positive from zero benchmark up to the fourth period before turning negative and rose completely leveled out in the baseline of zero. Also response of Real GDP to CGO is positive through the ten period of forecast while the reaction from Real GDP to CSM remains negative throughout the period.

On the other hand, the response of CPS to RGDP reveals that a shock from CPS to RGDP is positive throughout the period and completely leveled out at baseline. This result is consistent with the findings of Ndekwu (2013) and Obafemi and Ifere (2015). This is an indication that credit channel of the monetary policy transmission mechanism offers the platform through which

monetary policy actions can influence and trigger economy activities in the country. Again, the response of CGO to RGDP records negative innovation from underneath the zero baseline to the sixth period were it leveled out completely at the zero baseline. Further, the response of CSM to RGDP was negative and lapse through the period. Finally, the response of NDC to RGDP shows that when there is a shock RGDP remains negative at fourth period and completely leveled out at the zero benchmark.

Table 4: Variance Decomposition Analysis

Variance Decomposition of GDP

Period	S.E.	RGDP	CPS	CGO	CSM	NDC
1	8.513706	100.0000	0.000000	0.000000	0.000000	0.000000
2	10.62898	95.91622	2.153178	0.187866	0.453195	1.289540
3	10.97646	94.79788	2.093407	0.176474	1.722649	1.209589
4	11.10055	93.00190	2.333663	0.173248	3.289624	1.201567
5	11.27434	90.16023	2.763084	0.168374	4.918100	1.990212
6	11.41178	88.00253	2.918916	0.170454	6.003359	2.904743
7	11.48723	86.85575	2.930072	0.184259	6.613413	3.416508
8	11.52235	86.33435	2.916123	0.194995	6.942033	3.612495
9	11.53917	86.08811	2.907760	0.199433	7.123093	3.681599
10	11.54812	85.95792	2.904956	0.200790	7.228336	3.707998

Variance Decomposition of CPS:

Period	**S.E.**	**RGDP**	**CPS**	**CGO**	**CSM**	**NDC**
1	4.290857	0.228812	99.77119	0.000000	0.000000	0.000000
2	5.606817	0.137677	86.00194	0.483241	0.716047	12.66109
3	6.408449	0.105563	76.36918	0.478326	1.007384	22.03955
4	6.675994	0.098216	74.52119	0.682125	0.953307	23.74516
5	6.792062	0.103760	74.02347	0.813357	0.926071	24.13334
6	6.847893	0.116362	73.89031	0.849597	0.946119	24.19761
7	6.878504	0.128779	73.82853	0.861388	0.993735	24.18757
8	6.895708	0.137957	73.78851	0.866216	1.051314	24.15601
9	6.905732	0.144124	73.75700	0.868142	1.108895	24.12184
10	6.911874	0.148307	73.73036	0.868699	1.160189	24.09244

Variance Decomposition of CGO

Period	**S.E.**	**RGDP**	**CPS**	**CGO**	**CSM**	**NDC**
1	930.6796	0.046527	0.279977	99.67350	0.000000	0.000000
2	944.7250	0.064122	0.765088	96.73188	0.009046	2.429863
3	949.6329	0.114879	0.983879	96.02844	0.447603	2.425198
4	951.3423	0.170898	1.190525	95.68415	0.517420	2.437010
5	952.0526	0.180696	1.253276	95.54227	0.588060	2.435696
6	952.5048	0.183216	1.286119	95.45211	0.642363	2.436196
7	952.8129	0.184456	1.303185	95.39059	0.686941	2.434831
8	953.0378	0.185532	1.315494	95.34564	0.719145	2.434184
9	953.1952	0.186436	1.324494	95.31418	0.741167	2.433727
10	953.3040	0.187099	1.330946	95.29241	0.756209	2.433333

Variance Decomposition of CSM

Period	S.E.	RGDP	CPS	CGO	CSM	NDC
1	3.946292	0.009126	4.732927	1.051240	94.20671	0.000000
2	4.837075	2.245935	9.670467	0.930410	85.65812	1.495064
3	5.541914	2.699962	10.81289	0.711073	81.40366	4.372413
4	5.906846	2.948474	12.67108	0.632347	79.79468	3.953413
5	6.137277	2.988809	13.51381	0.587202	79.13922	3.770962
6	6.290370	2.985850	14.03121	0.559595	78.77341	3.649936
7	6.393698	2.980258	14.35869	0.542005	78.53396	3.585087
8	6.464403	2.977546	14.59224	0.530361	78.35885	3.541006
9	6.512655	2.977040	14.76261	0.522621	78.22946	3.508269
10	6.545651	2.977037	14.88470	0.517451	78.13653	3.484277

Variance Decomposition of NDC

Period	S.E.	RGDP	CPS	CGO	CSM	NDC
1	48.71597	0.077010	10.60329	2.451312	8.633990	78.23439
2	49.10961	0.754033	10.44652	2.960539	8.771397	77.06751
3	49.51701	0.852704	10.42489	3.304459	8.930783	76.48717
4	49.57541	0.860854	10.45235	3.300195	9.042889	76.34371
5	49.63941	0.858643	10.50200	3.293769	9.098248	76.24734
6	49.68093	0.857266	10.51992	3.290099	9.138086	76.19463
7	49.70097	0.856608	10.52374	3.289081	9.158034	76.17254
8	49.70973	0.856411	10.52373	3.288937	9.168294	76.16263
9	49.71324	0.856382	10.52325	3.288918	9.173466	76.15799
10	49.71480	0.856379	10.52287	3.288879	9.176207	76.15567

Cholesky Ordering: RGDP CPS CGO CSM NDC

The result of the variance decomposition analysis for credit channel as presented in table 4 shows that changes in the variation in real GDP accounted by its own shock seem to be the highest and changes from 100% within the first period to 85.96% over ten (10) period horizons. For growth in credit to the private sector (CPS), the result also revealed that the variations in real GDP accounted for by credit channel variables are low and started from 0.000 in the first period for CPS, CGO, CSM and NDC to 2.15%, 0.18%, 0.45% and 1.29% in the second period to about 2.33%, 0.17%, 3.29%, and 1.20% in the fourth period then 2.90%, 0.19%, 7.12% and 3.68% and 2.90%, 0.20%, 7.23% and 3.71% in the ninth and tenth period horizon respectively. As regards credit to private sector (CPS), the variance decomposition result shows that changes in CPS accounted for by its own shock is the highest and changes from 99.7% in the period to 74.52% in third period to 73.73% in the tenth period.

Table 5: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.532091	95.38381	69.81889	0.0001
At most 1 *	0.360984	53.61228	47.85613	0.0131
At most 2	0.264277	28.98189	29.79707	0.0619
At most 3	0.129417	12.10234	15.49471	0.1521
At most 4 *	0.078222	4.479776	3.841466	0.0343

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

Source: E-view 9.0 Output

The Johansen and Jusellius test for co integration between real GDP and credit channel transmission variables are depicted on table 5 above. The critical assumption was that of linear deterministic trend in the data series namely RGDP, CPS, CGO, CSM and NDC and test statistic is the trace statistic which indicates two (2) cointegrating equation(s) at 5% level of significance. From this it can be inferred that there exist a long run relationship between credit channel variables and economic growth in Nigeria (RGDP). Thus the hypothesis of no cointegration cannot be accepted in place of the alternative hypothesis.

Table 6: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob
CPS does not Granger Cause RGDP	55	1.20718	0.0076
RGDP does not Granger Cause CPS		0.03494	0.9657
CGO does not Granger Cause RGDP	55	1.10971	0.0063
RGDP does not Granger Cause CGO		0.08354	0.9200
CSM does not Granger Cause RGDP	55	1.71934	0.0020
RGDP does not Granger Cause CSM		0.89810	0.4138
NDC does not Granger Cause RGDP	55	1.24676	0.0023
RGDP does not Granger Cause NDC		0.25433	0.7764

CGO does not Granger Cause CPS	55	0.07405	0.9287
CPS does not Granger Cause CGO		0.27075	0.7639
CSM does not Granger Cause CPS	55	0.31414	0.7318
CPS does not Granger Cause CSM		0.24133	0.7865
NDC does not Granger Cause CPS	55	4.86339	0.0117
CPS does not Granger Cause NDC		0.05493	0.9466
CSM does not Granger Cause CGO	55	0.30967	0.7351
CGO does not Granger Cause CSM		0.18811	0.8291
NDC does not Granger Cause CGO	55	0.72423	0.4897
CGO does not Granger Cause NDC		0.28400	0.7540
NDC does not Granger Cause CSM	55	0.42533	0.6559
CSM does not Granger Cause NDC		0.05207	0.9493

Source: E-view 9.0 Output

The causality result presented in table 6 above shows that causality flows from CPS to RGDP, CGO to RGDP, CSM to RGDP and NDC to RGDP and this is significant at 5% level as confirmed by the probability value of their F-statistic (0.0076, 0.0063, 0.0020 and 0.0023). Thus, since the probability value of the causality between the credit channel variables and RGDP is less than 0.05, we reject the null hypothesis and accept the alternative. Therefore, we conclude that there is a causal relationship existing between credit channel variables (CPS, CGO, CSM and NDC) and economic growth in Nigeria.

4.5. Discussion of Findings

The empirical findings from this study reveal that credit channel is another mechanism through which monetary policy actions are transmitted into the economy. This process begins when the CBN alters the ability of banks to function by manipulating either reserve requirements or the real level of reserves. The importance of the credit channel arises from the role of the bank balance sheet channel in the intermediation process. The credit channel operates mainly through the bank lending channel and the balance sheet channel (Mishkin, 1995). The bank balance sheet channel functions through the net worth of the firms. According to the Modigliani- Miller theory bank lending basically depends on the banks capital structure, lending opportunities and market interest rates. Furthermore, the theory states that banks with low capital have delay and increased reaction to the interest rate shocks, relative to well capitalized banks. Thus, the effects of monetary policy

actions on bank lending will therefore depend on the capital inadequacy of the banking system. As such a tight monetary policy can decrease the firm's asset value and increase business cost via higher interest rates which reduces the firm's net worth. By reducing the net worth of the firm this implies lenders must accept less security for their loans, which increases the problem of adverse selection and reduces lending for investment spending. Lower firms net worth also leads to the problem of moral hazard due to the business owners have a lower equity stake in the firm and therefore, have an incentive to take part in risky projects. As a result, lending and investment spending decreases, in this situation, for an expansionary monetary policy to make an impact it will take a longer time. For the bank lending channel, a decrease in the supply of money leads to a decrease in deposits mobilization of the bank, which also decreases the quantum of money that the banks can actually loan out. This, in return, decreases investment and at last decrease aggregate demand. This means that this channel allows monetary policy to work without consideration of the interest rate, implying that decreasing interest rates may not be sufficient to increase investment. The philosophy underneath the credit channel of monetary policy transmission is hinge on it intermediation role, a situation where banks mobilizes savings from the surplus units to the deficit units of the economy and loaning out such funds to the investors.

However, our aprior expectation is that the credit channel of the monetary policy transmission mechanism will relate and impact on real GDP in Nigeria. Empirical findings from this study are in line with theoretical postulations of the monetarists that suggest that increasing money supply increases the total volume of credit banks can supply to the economy (the private sector, the government sector and small and medium enterprises (SMEs)) through the bank lending channel which in turn boost and trigger up aggregate demand and output. The results also collaborate with empirical findings of the previous scholars like Bernanke, (1986); Oliner & Rudebusch, (1995); Garretsen & Swank, (1998); De Bond, (1999); Arcangelis & Giorgio, (1999); Iturriaga, (2000) Kashyap & Stein, (2000); Morsink & Bayoumi, (2001); Huang, (2003); Sichei, (2005) for developed economies; Azali & Matthews (1999); Alfaro et al, (2003); Disyatat & Vongsinsirikul, (2003); Ramlogan, (2007); Ci, (2007); Catao & Pagan, (2010); Aleem, (2010) and Wulandari, (2012) for developing economies Abradu-otoo et al., (2003); Mashat et al., (2008); Mugume et al., (2011); Davoodi et al., (2013); Ndekwe, (2013); Ishioro, (2013); Chileshe et al., (2014) for African countries; Jimoh, (1990); Uchendu, (1996); Ojo, (2000); Nnnana, (2001); Oke, (2005); Adebiyi, (2006); Ajayi, (2007); Chuku, (2009); Chimobi & Uche, (2010); Nwosa & Saibu, (2012); Ismail, (2014); Obafemi & Ifere, (2015); Hassan, (2015) for Nigeria economy.

5. Conclusion

This study is predicated on the long age controversy among scholars and Theorists about the actual and level of monetary policy impact on real economic activities and how it is transmitted. Some schools of thought believe that money does not matter and monetary policy is ineffective in influencing real economic variables such as employment, and real output. While others school claim that money matters and monetary policy can influence real economic activities at least in the short run. The last school of thought is those in between these two opponents who believe that the link between money and output is actually reverse causation not the other way round. These controversies revolve on the issue of identifying the channel of transmitting monetary policy actions into the economy. Therefore, using the Vector Autoregressive (VAR) Model, this study sought to empirically analyze interest rate channel and credit channel of monetary policy transmission mechanism in Nigeria. Applying the time series data spanning the periods of 56 years 1960-2016, the empirical analysis found four interesting results as follows: firstly, all the interest rate and credit channels variables were non stationary at levels but appears stationary at first difference. Secondly, there is a short run direct link between interest rate channel, credit channel and Nigeria economic growth. Thirdly, there exist a long run equilibrium relationship between interest rate channel, credit channel and Nigeria economic growth. Fourthly, there is evidence of causality between interest rate channel, credit channel and Nigeria economic growth. Thus, the study came out with one stylized facts about monetary policy transmission mechanism in Nigeria as follows: that interest rate channel and credit channel of monetary policy transmission mechanism are fully effective, operative and functional in Nigeria and that the effective propagation of monetary policy in Nigeria are done through these two channels. Based on the findings above, the study recommends that the policy approach of encouraging, emphasizing and arousing the good management of interest rate channel and credit channel of transmission mechanism in Nigeria should be vigorously pursued. This has the ability to trigger up growth in various sectors of the Nigeria economy.

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