Does Central Bank Reserve Requirements Granger-Cause Economic Development?

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Abstract
This Study examined the Effect of Central Bank Reserve Requirement Policies on Economic Development of Nigeria (1986-2016). The objective of this study was to determine if the Central bank Reserve requirements represented by liquidity and cash reserve ratios, Granger-caused economic development. The monetarist theory, on which this work was anchored believe that Changes in monetary policy rates should result to direct and proportionate change in Economic Development of a country but some available findings from studies appear to disagree with this proposition. The study used secondary data sourced from World Bank, UNDP, Bureau of Statistics and the Central Bank of Nigeria; The research work selected Nigeria as its sample and used the OLS, Co-integration, Granger-causality and Error Correction model data Analysis techniques, to test the Effect of the independent variables (Cash reserves ratio, and Liquidity ratio) on the dependent variable, economic development (proxy by Human Development index) and tested at the 5% level of significance. The findings showed that reserve requirements captured by cash reserve and liquidity ratios, both showed positive, but insignificant, and significant effect respectively on economic development in the short-run period. Furthermore, all the tested variables showed positive and significant effects in the long-run period on economic development with significant speed of adjustments. The study concludes that the Central Bank reserve requirements does not Granger-cause economic development in the short –run but have positive and significant effect on economic development in the long run, and recommends amongst others that monetary authorities should allow ample time for cash reserve and liquidity ratios policies to achieve their target objective and avoid short term policy somersaults. Also, that such policies should be undertaken with caution not to stifle business and economic development activities while in operation.

Key word: *Central Bank, reserve requirements, cash reserve ratio, liquidity ratio, Human development index, inflation rate.*

1.0 Introduction

These instruments are used by the central bank to influence the level of bank reserves and hence, their ability to grant loans. Reserve requirements are lowered in order to free reserves for banks to grant loans and thereby increase money supply in the economy. On the other hand, they are raised in order to reduce the capacity of banks to provide loans thereby reducing money supply in the economy. The CBN complements the use of OMO with a reserve requirement. In this connection, the reserve requirement is an instrument for liquidity

management and for prudential regulation. The reserve requirements are the Cash Reserve Ratio (CRR) and the Liquidity Ratio (LR). While the former is defined as a proportion of the total demand, savings and time deposits which banks are expected to keep as deposits with the CBN, the latter refers to the proportion of banks' liquid assets to their total deposit liabilities. The CRR and liquidity ratio have been progressively increased or decreased depending on the complementary role the monetary authority tends to achieve.

Monetarist Economist believes that Changes in monetary policy rates should result to direct and proportionate change in Economic Development of a country; economic growth being one of the cardinal objectives of monetary policy, and every nation strives to attain a sustainable level of economic growth which will invariably translate into economic development that will ensure a reduction of unemployment rate, poverty, and poor standard of living which will eventually affect negatively on social welfare/wellbeing of the citizens.

It is evident from studies that there is huge disagreement on the likely effect of monetary policy instruments such as reserve requirements represented by cash reserve ratio and liquidity ratio, on the economy of a country; hence, while some researchers opine that the effect is positive and significant in the short-run (Suleman, Wasti, Lal & Hussaini, 2009; Adofu, Abula & Audu, 2010) , others maintain that it is negative (Folawewo & Osinubi, 2006; Eregha, 2010) and in some cases not significant while some hold that there is no relationship (Ditimi, 2009). Similarly, other researchers are of the view that there is no cointegration relationship between the monetary policy instruments and economic growths (Omoke & Ugwuanyi, 2010) while other group of scholars believed that there is a co-integrating vector between the variables (Okpara & Nwoha, 2010; Sanchita & Rina, 2011; Sanusi, 2002).

In this study, we attempted to resolve these disagreements as well as proffer answer to the question of our study whether Central Bank Reserve requirements Granger-Cause economic development. We have subdivided this study into five sections, namely; i) Introduction, ii) Review of Related Literature, iii) Data and Methodology, iv) Data Presentation and Analysis, and v) Conclusion and Recommendations

2.0 Review of Related Literature

2.1 Conceptual Review

i). Cash reserve ratio

Cash Reserve Ratio (CRR) could be defined as a proportion of the total demand, savings and time deposits which banks are expected to keep as deposits with the CBN.

Onoh (2007) observed that the ratio between the banking system's cash reserves and its current liabilities is determined by convention in some countries and by law in others to ensure its stability and that of the corresponding multiplier. In a country where the ratio of cash reserves to current liabilities is fixed by law, it would require an amendment of the law by the parliament to alter the ratio; hence cash reserve ratio is also referred to as fixed reserved ratio or minimum legal reserve ratio. A deposit-money bank must set aside the mandatory cash reserve from every deposit it receives, before utilizing the balance called the free or excess reserve for the purpose of bank-credit money creation. The volume of free reserves of a bank defines its lending potential or its lending limit, at a given point of time. A bank cannot lend beyond the limit imposed by its excess reserve and the ruling multiplier.

The sum of the legal tender money held by a commercial bank (vault cash), and the current account of the commercial bank held at the central bank is called the deposit-money bank cash reserves. A deposit-money bank's cash reserves constitute a small fraction of the bank's

current account liabilities. Normally, it attracts No interest payment, hence commercial banks tend hold a minimum of cash reserves unless forced by regulation to hold more cash reserves. Moreover, banks customer continues to pay in cash on daily basis which a bank can utilize without having to fall back on its reserves. Since, cash reserves is sterile money, a non-interest yielding assets, banks prefer holding the bearest minimum of cash reserves, while the Central Bank tends to set the minimum level of cash reserves at a higher level of ratio to safeguard the liquidity of banks and creditors' interest.

Any change in the banking system credit multiplier invariably affects the economy's level of money supply, in the short and long-run. The bank credit multiplier can only be determined, if the banking system reserves ratio and currency ratios are known. The magnitude of the reserve ratio, **r**, is usually greater than zero but less than 1. It determines the per centage or proportion of demand deposit a bank must statutorily keep with the central bank, as minimum cash reserves, before any lending or bank credit creation begins.

ii). Liquidity ratio

This is the proportion of banks' liquid assets to their total deposit liabilities as defined from time to time by the regulatory authorities.

The liquidity ratio was fixed by the Central Bank of Nigeria (amendment) Act of 1962. It is the percentage of deposit liabilities which the commercial banks must hold in the form of liquid assets. The ratio was fixed at 25 per cent of a commercial bank's total liabilities (Onoh, 2013). CBN monetary policy circulars (MPC) issue from time to time add or subtract assets for the purpose of computing the liquid assets ratio. For instance, MPCs nos. 5 and 7 of the fiscal years 1973/74 and 1975/76 respectively added "call money" and "eligible development stocks" of less than 3 years to maturity, as assets which also qualify for the purpose of computing the liquidity ratio. MPC no. 8 of 1976/77 fiscal year abolished the 40% minimum holding of treasury bills and treasury certificates in terms of total liquid asset ratio. Cash reserve requirements, stabilization securities and advanced deposits for letter of credit were excluded by monetary policy circular no. 8 referred to above and monetary circular paper no.9 of 1977/78 from the computation of the liquid assets ratio. Monetary policy circular no.12 of 1980 further excluded shortfalls of loans to agriculture and residential building construction. CBN insists on a viable liquidity ratio to ensure that commercial banks are sufficiently liquid at all times to satisfy customers' needs and to build up depositor's confidence in the banking system. The formula for calculating the liquidity ratio of a deposit-money bank is as follows;

Liquidity Ratio = Total Specified Liquid assets / Total Current Liabilities

CBN reserves the right to vary the ratio depending on the prevailing economic circumstances. A variation of the liquidity ratio requires a careful assessment of the economic conditions such as the level of employment, the price level and the rate of growth. An upward variation of the ratio will imply a policy of credit restraint. The policy reduces the excess reserves of the deposit money banks, the platform for multiple credit money expansion by the deposit money banks. The excess reserves become reduced by an amount equal to the aggregate increase in the liquidity ratio. If the objective of varying the ratio is to encourage spending and stimulate aggregate demand, the liquid-asset ratio is lowered. If the intention is to contain inflation, the ratio is raised.

iii) Human Development Index

The construction of HDI has been explained fully in Human Development Report (1999, p.159-1960). The value ranges from 0 to 1, where 0 implies no development and 1 mean full development. Normally, no country lies at the extremes and possesses a value between these

two numbers. Though, the main structure is the same there has been some change in its construct since 2011, as elaborated in Human Development Report (2010). Contrary to simple income or single development measures like poverty Alleviation, unemployment, etc HDI is a composite of three different components. Each of them is listed below with all the necessary detail.

i. Standard of Living:

The first component is the standard of living, and the proxy used to calculate it is the natural log of gross national income (GNI) per capita adjusted purchasing power in US dollars. GNI is different from GDP in that it is composed of the sum of all value added by resident producers in the economy plus product taxes plus receipts of primary income from abroad. Then, the GNI is normalized for each of the country by the formula:

Income Index (II) = ln GNI –ln (min) / ln Max −ln (min)

Where ln (max) and ln (max) are natural logarithm for maximum and minimum GNI reported for that particular year.

ii. Education:

The education level of each country can be calculated through the education index. Two variables; mean years of schooling and expected year of schooling are given one-half weight each. Adult literacy rate has been replaced by mean years of schooling and expected year of schooling has replaced combined enrolment ratio for primary, secondary and tertiary institutions. The formula for education index is

$$Education\ Index\ EI = (MYS-MYSMIN\ /MYSmax-MYSMIN \times(EYS-EYSMIN\ / EYSMAX-EYSMIN))12$$

Where, MYS is mean years of schooling and EYS is expected years of schooling.

iii. Health and Longevity:

Longevity is measured by life expectancy at birth and normalized by the formula

$Longevity\ (LI)=L-LMIN\ /\ LMAX-LMIN$

Where L is life expectancy at birth for a country and min and max are minimum and maximum values for that particular year.

Finally, the HDI can be calculated by taking the geometric mean for all three measures as: $= EI \times II \times LI3$

For example for year 2011, Norway tops the list with the HDI of 0.943, and the Republic of Congo is ranked at the bottom of the list composed of 183 countries with the HDI of 0.283 (Human Development Report 2011, p.138).

Al-Hilani (2012) noted that HDI has provided us with the multiple-dimensional framework to measure development compared to one dimensional income approach of poverty alleviation, unemployment etc. There may present certain issues with the construct and form of HDI, but it does not debilitate its importance as one of the simple indices that provide us insight with some of the basic human freedoms. Moreover, lots of improvements have been made in the mathematical construct of HDI along time, and HDI has proved to be a much reliable index now compared to other indices.

iv) Overview of Inflation

Inflation could be defined as an economic situation in which the increase in money supply is “faster” than the new production of goods and services in the economy (Hamilton, 2001). More often than not economists draw a line of difference between inflation and an economic condition of a onetime increase in price or when there are price increases in a

narrow group of economic goods and services (Piana, 2001). Consequently, inflation signifies a general and persistent increase in the prices of goods and services in an economy (Ojo, 2000; Meberg, 1992).

Usually, the rate of inflation is measured by the percentage change in the price index, which may be wholesale price index, producer price index, or consumer price index. In Nigeria, inflation is measured as the percentage change in the consumer price index, which aggregates the price of a representative basket of goods and services purchased by the average consumer, and obtained through periodic survey of consumer prices (CNB, 2005; Essien, 2002).
The National Bureau of Statistics has the statutory responsibility for compiling inflation statistics in Nigeria. Different weights are assigned to the goods in the representative consumer basket. As a result of these weights, changes in the prices of some goods in the basket exert varying effects on measured inflation. However, in this research work we will use the headlines inflation used by CBN as against the consumer price index. As regards the causes of inflation; three school of thought stand out; the neo-Classical/monetarist, neo-Keynesian and Structuralist. The neo-Classical/monetarists opine that inflation is driven mainly by growth in the quantum of money supply. However, practical experiences of the Federal Reserve in the United State (US) have shown that this may not be entirely correct. To buttress this, the US money supply growth rates increase faster than the price itself (Hamilton, 2001; Colander, 1995). This has been traced to the increased demand for the US dollar as a global trade currency (Mordi, 2007). On the other hand, the neo-Keynesians attribute inflation to diminishing returns of production. This occurs when there is an increase in the velocity of money and an excess current consumption over investment. Finally, the Structuralists postulated that inflation is caused by structural factors as well as the underlying characteristics of the economy (Adamson, 2000). Examples of these structural factors may include hoarding and hedging in Nigeria (Adebiyi, 2009; McCallum and Nelson 2010; Habibullah et al. 2011).

There are so many factors that affect inflation but the most popular ones could be narrowed down to institutional, fiscal, monetary and balance of payments. Several studies (Melberg, 1992; Cukierman, Webb and Neyapti, 1992; Grilli, et al 1991; Adesina and Summers, 1993; Posen, 1993; Pollard, 1993, Debelle and Fischer, 1995) have shown that the level of independence (legal, administrative, instrument, etc.) of the monetary authority is an important institutional factor that determines inflation, especially in industrialised countries, while the rate of turnover of Central Bank Governors in developing countries was seen as an important factor influencing inflation. However, caution must be exercised in the interpretation of these findings, given the difficulty in measuring the actual level of independence of a central bank (CBN, 2009).

2.2 The Monetarist Theory

The monetarists, following the Quantity Theory of Money (QTM), have propounded that the quantity of money is the main determinant of the price level, or the value of money, such that any change in the quantity of money produces an exactly direct and proportionate change in the price level (Friedman, 1970; Thomas, 2006; Handa, 2009). The QTM is traceable to Irving Fisher's famous equation of exchange;

$$MV = PQ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . (1)$$

Where M stands for the stock of money; V the velocity of circulation; Q the volume of transactions which take place within the given period; while P stands for the general price level in the economy. Transforming the equation by substituting Y (total amount of goods and services exchanged for money) for Q, the equation of exchange becomes

$$MV = PY \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . (1)$$

The Introduction of Y provides the linkage between the monetary and the real side of the economy. In this framework however, P, V and Y are endogenously determined by the monetary authorities. The monetarists emphasised that any change in the quantity of money affect only the price level or the monetary side of the economy, with the real sector of the economy totally insulated. This indicates that changes in the supply of money do not affect the real output of goods and services, but their values or the prices at which they are exchanged only (ECB, 2013; Doherty, 1995; Ip Greg and Whitehouse, 2006; Cunningham and Ronald, 1990). An essential feature of the monetarist model is its focus on the long-run supply-side properties of the economy as opposed to the short run dynamics (Philips, 1987).

2.3 Empirical Review

Studies by various researchers on this subject have produced conflicting outcomes over the years in different continents. Some of these include:

Nkoro (2005) on a topic "monetary policy and macroeconomic instability in Nigeria (1980 – 2000)" concluded that factors responsible for excess liquidity and inflationary pressure in Nigeria included: instability of the financial sector, which was attributed to bank distress and lack of managerial efficiency, resulting to financial institution failures, non-harmonization of fiscal and monetary policies and increase in government expenditure.

Folawewo and Osinubi (2006) used rational expectation approach to conclude that the effort of Monetary Authority in Nigeria at using its credit and reserves as monetary tools in checking inflation and the rate of exchange has affected the volatility of the two variables over the years. Thus monetary policy, if not well targeted could yield negative results. This is because the speculations of the private agents may frustrate monetary effort (Berg and Pattillo, 1999), just as improper inflation targeting could affect real exchange rate volatility (Amato and Gerlach, 2002) and exchange rate intervention induce inflation (Galati, 2000). Thus monetary policy should be set in such a way that the objective it set to achieve is well defined, in a way that effort at stabilizing exchange rate will not generate inflation and vice versa.

Additionally, several studies (Idowu, 2010; Uchendu, 2009 and Nkoro, 2005) have established that huge public spending has constrained the efficacy of monetary policy in Nigeria. They buttressed that huge public spending by the three tiers of government, over the years, had hampered monetary management resulting in the missing of monetary targets by wide margins, while inducing serious pressure on the general price level. Moreover, the poor state of economic infrastructure, resulting from past neglect, influence monetary management adversely.

Suleman, Wasti, Lal and Hussaini (2009) in their study of money supply, output and prices in Pakistan found out that M_2 positively impact on prices in the economy.

Olubusoye and Oyaromade (2008) analysed the sources of fluctuations in inflation rate in Nigeria using the framework error correction mechanism and found out that the lagged consumer price index (CPI) among other variables propagate the dynamics of inflationary process in Nigeria. The level of output was found to be insignificant but the lagged values of money supply was found to be negative and significant only at 10% level in the parsimonious error correction model.

Omoke and Ugwuanyi (2010), Okpara, (1998) in their long-run study of money, price and output in Nigeria found out no co-integrating vector but however found out that money supply granger causes both output and inflation, suggesting that monetary stability can contribute towards price stability. They also concluded that inflation in Nigeria is a monetary

phenomenon.

Okpara and Nwoha (2010) employed a two stage least square method and a reduced form of the growth model was singled out for long run co-integration and casualty test. Their result revealed that money supply is a positive and significant function of prices and also granger causes prices with no reverse or feedback effect.

Ditimi (2009) adopted a simplified ordinary least squared technique and conducted the unit root and co- integration test in his analysis on monetary policy and macroeconomic stabilization in Nigeria and found out that interest rate has an insignificant influence on price stability.

Adofu, Abula and Audu (2010) analysed the impact of interest rate deregulation on the Nigerian economy using a time series data spanning 1986-2005 and observed that interest rate plays a significant role in enhancing economic activities. The empirical analysis showed that interest rate deregulation has a significant and positive impact on Agricultural productivity in Nigeria.

Eregha (2010) examines variations in interest rate and price stability in Nigeria, using a time series data 1970-2002, employed instrumental variable technique and found out that variation in interest rate played a negative and highly significant role on price decisions in the economy.

Daferighe, and Aje, (2009) using a time series data 1997-2006 employed the OLS method of regression and analysed the impact of the real Gross Domestic Product on stock market prices and found out that increased RGDP has a positive impact on stock market prices.

Onyeiwu (2012) studied monetary policy and economic growth in Nigeria using the Ordinary least square regression using liquidity ratio, cash reserve ratio, money supply, monetary policy rate and Treasury bill rate, the study adopted monetarist theory and discovered that liquidity and cash reserve ratio showed a positive and significant relationship with economic growth.

3.0 Data and Methodology

3.1 Source and Nature of Data

The study made use of data mainly from secondary sources, particularly published data from research work of monetary policy department of CBN, the World Bank and the United Nations Development Project (UNDP). Secondary data will be obtained from the statistical bulletin of the Central Bank of Nigeria and will be used for the analysis of the study. We will equally use data from the published works in CBN official websites, Statistical Bulletins, monthly journals, financial reviews as well as Annual Reports and various communiqués of the monetary policy committee meetings. Another source of data for the study will include statistics and published materials by the National Bureau of Statistics (NBS), Nigerian Economic Society, Newspapers, Magazines, Journals, Seminar papers as well as my previous lecture notes and similar studies conducted in this direction. The data obtained was analysed using Econometrics text kit (Software) called E-view –Version 9.

The data used for this study are those relating to:

1. Human Development Index (HDI) - Dependent Variable
2. Reserve requirements – Cash reserve ratio - Independent variable
   - Liquidity ratio - Independent variable

3.2 Model Specification and Validity

This research work adopted the model of Onyeiwu (2012) with slight modifications (for example replacement of gross domestic product (GDP) with Human development index

(HDI) and the use of inflation as a moderating variable due to its strong effect on price levels and money supply);

GDP = a_0 + $a_1$lr + a_2M_2 + a_3Cr + Ui (1) (Onyeiwu, 2012)

Where GDP - Gross Domestic Product
Lr - Liquidity ratio
M_2 - Broad Money Supply
Cr - Cash ratio
A_0, a_1, a_2 and a_3 - Parameters
Ui - Error term

Adjusting above model after our work, we have;

HDI = f(RER) ..... (2)

Transforming to multiple linear relationship;

HDI = c_0 + c_1CRR + c_2LR + c_3INFR + u ..... (3)

$\mu = Error\ term$
$c0 = Intercept$
$c_{1-}\ c_3 = parameters/\ coefficients$

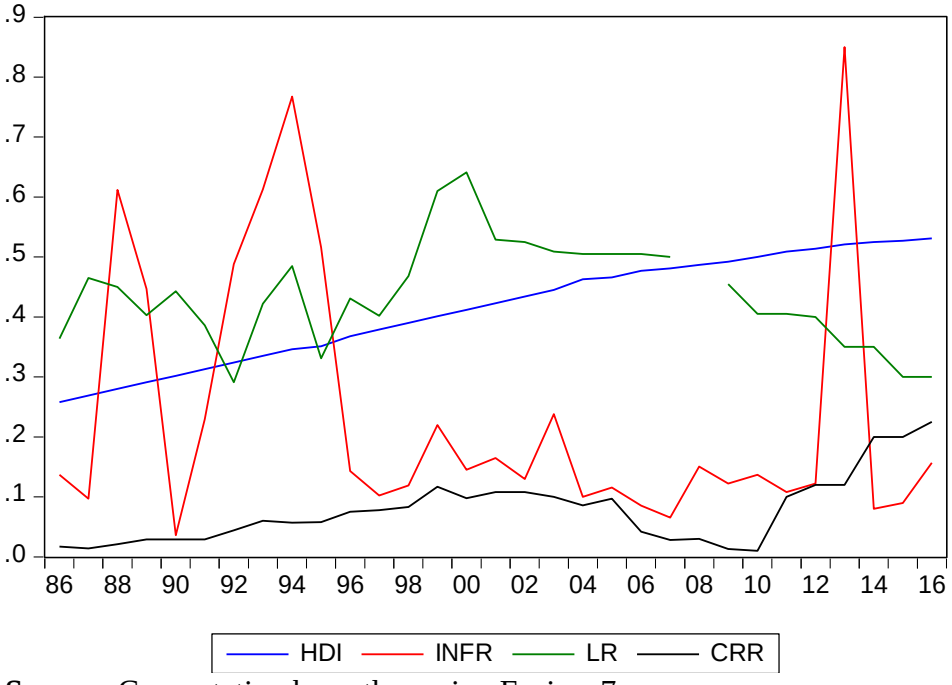
Where HDI = Human Development Index
CRR = Cash reserve ratio
LR = Liquidity ratio
INFR = Inflation rate

Apiriori expectation: HDI, CRR, LR, INFR > 0 (positive and significant)

4.0 Data Presentation and Analysis

Table 4.1 Data for Selected Variables (See appendix 1)

Fig. 4.1



Source: Computation by author using E-view 7

Figure 4.1, shows that while CRR has been on the rise between 1986 and 2005, it however, started falling after 2005 till 2011 before it started rising again and within the period rose over 20%. The liquidity ratio (LR) within the the period grew from over 25% to about 65% in

2000 and started declining to 50% in 2006 and further to 30% in 2016. HDI (Dependent variable) again, has maintained a consistent linear growth indicating that the various oscillating independent variables such as CRR and LR have had a positive effect on the Economic development of Nigeria measured by HDI. Hence, showing effective management on the part of the economic managers and monetary authorities.

4.1 Diagnostic Tests

The aim here is to carry out various diagnostic tests to ensure that our data and model used in this research work conforms to the basic assumptions of the classical linear regression. This will ensure that the output of this process is not error prone and is reliable.

4.1.2: Test for Stationarity

The test for stationarity requires that the variables in the series model must be stationery at a given level and p-value must be significant at that level. Stationarity is attained where the test statistics is most negative and greater than the critical value of the chosen level of significance.

Table 4.2 Unit root table

Variables	ADF Test Statistics	Critical Values @5%	P-value	Order of Integration
HDI	**-3.6948**	**-2.9640**	**0.0094**	**I(0)**
LR	**-6.1837**	**-2.9810**	**0.0000**	**I(1)**
CRR	**-9.5766**	**-2.9763**	**0.0000**	**I(2)**
INFR	**-3.8417**	**-2.9640**	**0.0066**	**I(0)**

Source: Author's E-view 7 Computation

Table 4.2 shows that the variables – HDI and INFR are stationery at levels, CRR is stationery at second difference while LR is stationery at first difference. Their respective p-values are all significant confirming stationerity at the 5% level of significance.

4.1.3 Test for Heteroskedasticity (Arch)

The assumption of the classical linear regression that the variance of the errors is constant is known as *Homoskedastycity*. If the variance of the errors is not constant, this would be known as *Heteroskedasticity.* Hence, we test for the presence of heteroskedasticity with the intention of treating same if found. The treatment method adopted here is the Autoregressive conditionally Heteroscedastic test known as ARCH. The Null hypothesis states that there is no Heteroscedasticity if the p-value is greater than the level of significance (Brooks, 2014).

Table 4.3: Heteroskedasticity – Arch Test

Heteroskedasticity Test: ARCH			
F-statistic	0.699348	Prob. F(1,19)	0.4134
Obs*R-squared	0.745523	Prob. Chi-Square(1)	0.3879

Source: Author's E-views computation

The null hypothesis states that there is No heteroskedasticity if p-value is not significant and is greater than the chosen level of significance of 5%. Hence, in this case we accept the Null hypothesis that there is no evidence of heteroskedasticity since p-value is greater than 5% significance level.

4.1.4 Ramsey Reset Tests

Table 4.4: Ramsey Reset Specification Test

Ramsey RESET Test				
Equation: UNTITLED				
Specification: HDI C CC(5) DD(5) QM(5) MPR(5) INTR(5) CRR(5) LR(5)				
TBR(5) CBTC(5) INFR(3)				
Omitted Variables: Squares of fitted values				
	Value	df	Probability	
t-statistic	0.030749	12	0.9760	
F-statistic	0.000946	(1, 12)	0.9760	
Likelihood ratio	0.001891	1	0.9653	

Source: Author's E-views computation

The p-values in table 4.4 for t and F-statistics being greater than the 5% significance level, indicates that the test statistics are not significant at the 5% level. We thus accept the Null hypothesis that the regression model is linear.

4.2.1 Test of Hypothesis

Ho_1: There is no significant relationship between reserve requirements captured by cash reserve ratio (CRR) and liquidity ratio (LR), and economic development of Nigeria.

H_{i1}: There is significant relationship between reserve requirements captured by cash reserve ratio (CRR) and liquidity ratio (LR), and economic development of Nigeria.

4.2.2 OLS Regression Test for Short-run Effect

Table 4.5: Regression Result for Reserve Requirements

Dependent Variable: HDI				
Method: Least Squares				
Date: 03/27/18 Time: 14:22				
Sample (adjusted): 1988 2013				
Included observations: 25 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.009515	0.004635	2.052988	0.0534
CRR(3)	0.000635	0.013191	0.048155	0.9621
LR(3)	0.018581	0.007544	2.463017	0.0230
INFR(-2)	-0.002869	0.003825	-0.749979	0.4620
HDI(-1)	0.982171	0.010145	96.81592	0.0000
R-squared	0.998865	Mean dependent var		0.409520
Adjusted R-squared	0.998638	S.D. dependent var		0.077443
S.E. of regression	0.002858	Akaike info criterion		-8.700455
Sum squared resid	0.000163	Schwarz criterion		-8.456680
Log likelihood	113.7557	Hannan-Quinn criter.		-8.632842
F-statistic	4400.061	Durbin-Watson stat		2.088820
Prob(F-statistic)	0.000000			

Source: Author's computer generated Eviews result

In table 4.5, the R^2 and Adjusted R^2 both showed 99.89% and 99.86% respectively. This shows that the chosen regression model best fits the data. Hence, the goodness of fit regression model is 99.89% and implies that chosen explanatory variables explain variations in the dependent variables to the tune of 99.89%. Also, with a high Adjusted R^2 (99.86%) implies that the model can take on more variables conveniently without the R^2 falling beyond 99.86%, which is very commendable. F-statistics of 4400.061 is considered very good being positive and significantly large enough and it shows that there is significant positive relationship between the dependent and explanatory variables. The overall probability (F-statistics) of 0.0000 is rightly signed and very significant and displays a Durbin-Watson of 2.0888, which is considered good as it shows little or no effect of autocorrelation on the chosen data.

Hence, from table 4.5, the CRR(3) at lead 3, has a t-statistic value of 0.04816 and a p-value of 0.9621, was found to have a positive effect on HDI and this effect is statistically not significant at 5% level since its p-value is greater than 0.05 while, the LR(3) at lead 2, was found to have a t-statistic value of 2.4630 and a p-value of 0.0230, was found to have a positively significant effect on HDI. Therefore, we reject null hypothesis to accept the alternative. However, the INFR(-2) at lag 2, has a t-statistic value of -0.74998 and p-value of 0.4620 and this effect is negative and statistically not significant at the 5% level. The implication of this result is that a 1% increase in CRR will result to a 0.0635% increase in HDI while a 1% rise in liquidity ratio will result to a 1.8581% increase in HDI and the coefficient of the future levels of CRR and LR variables both have a positive sign and is positive at the 5% significance level.

4.2.3 Co-integration test for long-run effect

Table 4.6: Co-integration result

Date: 03/27/18 Time: 14:47				
Sample (adjusted): 1988 2016				
Included observations: 26 after adjustments				
Trend assumption: Linear deterministic trend				
Series: CRR HDI INFR LR				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.591780	48.76819	47.85613	0.0409
At most 1	0.551539	25.47351	29.79707	0.1452
At most 2	0.124715	4.623230	15.49471	0.8474
At most 3	0.043630	1.159881	3.841466	0.2815
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

Source: Author's E-views computation

The Johansen Co-integration Tests reveal the existence of co-integration with a p-value of 0.0409 for a trace statistic of 48.7682 between HDI and CRR. We thus confirm that CRR has a co-integration effect (long-run) on economic development proxied by HDI (Human Development Index) with one co-integrating vector.

Decision rule: We reject null hypothesis of the co-integration relationship to accept the

alternative that there is Co-integration. We thus, conclude from the result that Cash reserve ratio has a long-run effect on Economic development proxied by HDI (Human Development index)

4.2.4 Granger-Causality test for the Model

Table 4.7: Granger-Causality Result for the model

Pairwise Granger Causality Tests			
Date: 03/27/18 Time: 15:13			
Sample: 1986 2016			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
HDI does not Granger Cause CRR	30	1.16443	0.2901
CRR does not Granger Cause HDI		0.03099	0.8616
INFR does not Granger Cause CRR	30	2.18192	0.1512
CRR does not Granger Cause INFR		0.42863	0.5182
LR does not Granger Cause CRR	28	5.00009	0.0345
CRR does not Granger Cause LR		0.20645	0.6535
INFR does not Granger Cause HDI	30	0.27331	0.6054
HDI does not Granger Cause INFR		2.21981	0.1478
LR does not Granger Cause HDI	28	1.13468	0.2970
HDI does not Granger Cause LR		0.88325	0.3563
LR does not Granger Cause INFR	28	0.19038	0.6663
INFR does not Granger Cause LR		0.12873	0.7228

Source: Author's E-views computation

The result in table 4.7 shows that CRR does not granger-cause HDI and HDI does not granger-cause CRR as their respective p-values are higher than the chosen level of significance of 5% being 0.8616 and 0.2901 respectively. Similarly, LR does not granger-cause HDI and HDI does not granger-cause LR as p-values is greater than 0.05 being 0.2970 and 0.3563 respectively. Hence, we conclude that CRR and LR does not granger-cause economic development proxied by HDI and HDI does not granger-cause cash reserve ratio and liquidity ratio proxied by CRR and LR respectively.

4.2.5 Error Correction Term for the Model

Table 4.8: Residual Unit Root test

Var	ADF stat	Critic.value@5%	P-value	Order of integ
ECT3	-4.9195	-2.9981	0.0007	I(0)

Source: Author's E-views computation

Table 4.9: Error Correction Model

d(hdi) = c + d(crr(3)) + d(lr(-3)) + d(infr(1)) + ect3(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010068	0.000784	12.84913	0.0000
D(CRR(3))	-0.062060	0.032311	-1.920710	0.0728
D(LR(-3))	0.006094	0.010261	0.593862	0.5609
D(INFR(1))	0.003687	0.003632	1.015099	0.3252
ECT3(-1)	-0.704065	0.309230	-2.276829	0.0369

Source: Author's E-views computation

This section presents the result of the ECM for the model. The model of the ECM is on the table 4.9 and the estimates of the short-run and long-run movements, as well as the error correction term, which proxies speed of adjustment, are provided in the table 4.9. The table shows useful long-run information. The equilibrium adjustment coefficient 70.41% enters with a correct sign "negative". This suggests that cash reserve ratio and economic development proxied by Human Development index (HDI) converges to long-run equilibrium; it can also be observed that ECT3(-1) coefficient tends to one, indicating that the speed of adjustment to equilibrium is fast. It shows that 70.41% of the deviation from the equilibrium path is corrected on a yearly basis. The ECM result therefore confirms the long-run relationship between cash reserve ratio (CRR), liquidity ratio (LR) and economic development (HDI) from the residual unit root test and the co-integration tests respectively.

4.4 Discussion of Findings

The outcome of our work on this objective showed a regression result of positive and insignificant (p-value = 0.9621) effect of cash reserve ratio on economic development of Nigeria in the short-run (with a positive t-statistic of 0.0482) and a positive and significant (p-value= 0.0230) effect of liquidity ratio on economic development of Nigeria in the short-run period while the long-run (co-integration) test revealed a positive and significant effect of CRR on economic development only. The position is supported by the work of Dotimi (2009) and Chimaobi and Uche (2010) who found an insignificant relationship and a positively significant long-run relationship respectively between monetary policy instruments and economic growth. The granger causality however showed an insignificant result between HDI, CRR and LR while Error correction term speed of adjustment is very fast at 70.41% and highly significant at a p-value of 0.0369). The coefficient of the future levels of CRR has a positive sign (0.000635) and LR has a positive sign (0.01858) at the 5% level of significance. This result indicates that the coefficients of the future levels of CRR(3) and LR(3) have a positive sign and impressive effect on level of economic development at the 5% level of significance. This implies that a 1% increase in future levels of CRR will result to a 0.0635% rise in level of economic development and a 1% rise in future levels of LR will result to a 1.858% increase in economic development. While, the theoretical basis for this outcome agrees with LR result, it however, is at variance with the result of CRR on tenents of the monetarist theory in the short-run but agrees with it in the long-run.

5.0 Conclusion and Recommendation

5.1 Conclusion

From the result of this study, we conclude that reserve requirements captured by cash reserve ratio, have positive and insignificant effect while liquidity ratio have positive and significant effect on economic development of Nigeria in the short-run period using the OLS technique but the Granger-causality technique for the short run showed that both cash reserve ratio and liquidity ratio does not granger-cause economic development; while, both have a positive and significant effect on economic development in the long-run period using the co-integration technique.

5.2 Recommendation

Based on the result of our investigations, we recommend that:

1. The financial system should not be starved of necessary funds for lending and credit creation through mandatory liquidity and cash reserve ratios in order to stimulate economic activities and development.
2. The fixing of the liquidity and cash reserve ratios should follow predictable patterns, to enable the banking public and businesses thrive efficiently.

3. Reasonable long time should be given by monetary authorities to Cash reserve and liquidity ratios policies to enable them accomplish their target objectives.

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APPENDIX

Table 4.1 Data for Selected Variables

Year	CRR	LR	INFR	HDI
1986	0.017	0.364	0.1367	0.258
1987	0.014	0.465	0.0969	0.269
1988	0.021	0.450	0.6121	0.280
1989	0.029	0.403	0.4467	0.291
1990	0.029	0.443	0.0361	0.302
1991	0.029	0.386	0.2296	0.313
1992	0.044	0.291	0.4880	0.324
1993	0.060	0.422	0.6126	0.335
1994	0.057	0.485	0.7676	0.346
1995	0.058	0.331	0.5159	0.351
1996	0.075	0.431	0.1431	0.368
1997	0.078	0.402	0.1021	0.379
1998	0.083	0.468	0.1191	0.390
1999	0.117	0.610	0.2200	0.401
2000	0.098	0.641	0.1453	0.412
2001	0.108	0.529	0.1649	0.423
2002	0.108	0.525	0.1297	0.434
2003	0.100	0.509	0.2381	0.445
2004	0.086	0.505	0.1001	0.463
2005	0.097	0.505	0.1157	0.466
2006	0.042	0.505	0.0855	0.477
2007	0.028	0.500	0.0656	0.481
2008	0.030	0,455	0.1506	0.487
2009	0.013	0.455	0.1220	0.492
2010	0.010	0.405	0.1370	0.500
2011	0.100	0.405	0.1080	0.509
2012	0.120	0.400	0.1220	0.514
2013	0.120	0.350	0.8500	0.521
2014	0.200	0.350	0.0800	0.525
2015	0.200	0.300	0.0900	0.527
2016	0.225	0.300	0.1570	0.531

Source: CBN, NBS and UNDP (2017)