Money Supply and the Liquidity of Deposit Money Banks in Nigeria

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ABSTRACT
This study examined the effect of money supply on the liquidity of deposit money banks in Nigeria. The objective was to study the extent of money supply on the liquidity of deposit money banks. Time series data were sourced from Central Bank Statistical Bulletin from 1987-2021. Liquidity of deposit money banks was modeled as the function of narrow money supply, quasi money, broad money (M2) and broad money (M3). Ordinary least square methods of unit root test, cointegration and Vector Error Correction. Findings of the study revealed that money supply explained 76% variation in liquidity of commercial banks in Nigeria while the remaining 24% is traceable to exogenous variables not captured in the model and further proved that narrow money supply have positive and significant effect, quasi money have negative but no significant effect, broad money supply (M2) have positive and significant effect while broad money supply (M3) have positive but no significant effect on the liquidity of commercial banks over the periods of the study. The study concludes that narrow money supply have positive and significant effect on the liquidity of commercial banks, the null hypothesis is not accepted. Quasi money have negative but no significant effect on the liquidity of commercial banks, the null hypothesis is accepted, broad money supply (M2) have positive and significant effect on the liquidity of commercial banks, the null hypothesis is not accepted while broad money supply (M3) have positive but no significant effect on the liquidity of commercial banks, the null hypothesis is accepted. The study recommends that monetary authorities should ensure adequate money supply in the economy as this determines the liquidity of the financial market at large and policies should be deepened the operations of deposit money banks to ensure that money supply goes through the banking sector. There is need to regulate access to money through electronic channels as frequent cash withdrawals affect negatively the liquidity of the deposit money banks. The money authorities should strengthen the spread of deposit money banks for effective mobilization of money outside the banking system such as the rural banking and rural financial intermediation and the regulatory authorities and the money market institutions should formulate policies that enhance operational efficiency of the money market for better liquidity of the deposit money banks.

Keywords: *Money Supply, Liquidity, Deposit Money Banks, Nigeria*

INTRODUCTION

Prior to the Banking Ordinance of 1952 commercial banks operated without regulations, the CBN Act of 1969 empowered the Central Bank Regulatory functions over the commercial banks. The Act empowered Central Bank to ensure stability of the financial market. Liquidity is a measure of commercial bank soundness indicator. However, the wave of banking sector crisis and liquidation in Nigeria for the post three decades attract attention of the policy makers. It was such that management could not detect the early warning signals. The causative factors of the crisis are not always internal factors but rather other factors within the financial market. For instance, the withdrawal of all public fund in the banking sector in 1989 did not only threaten the liquidity of the banking institutions but led to the banking sector crisis of the early 1990s just like the single treasury account has challenged the liquidity of the commercial banks. Diamond and Dybvig (1983) noted that one of the key reasons why banks are fragile is their role in transforming maturity and providing insurance as regards depositors' potential liquidity needs.

Over the years, liquidity has been one of the major challenges hindering the stability of banks in Nigeria due to their reliance on government central bank credits as their major sources of stable funding. As a result, many attempts by the banking regulators to ensure liquidity of the banking industry have not achieved targeted objectives (Sanusi, 2011; Soludo, 2004) as the issues of banking crisis continuous despite the banking sector consolidation and recapitalization. The banks in Nigeria engage in a highly risky business such as foreign exchange trading, oil gas business, stock market margin finance as their major source of earnings, especially, when they have high liquidity influx. For instance, Sanusi (2011) stated that the abundant liquidity into the banks had led to excessive lending by the Nigerian banks which subsequently resulted to loan growth and loan concentration in the oil and gas business and margin finance.

Furthermore, at the international level, the Basel Committee for Banking Supervision (BCBS) has introduced liquidity standards in the Basel III to buffer against banks run. The standard includes the liquidity coverage ratio (LCR) and the Net stable funding ratio (NSFR) which requires banks to maintain sufficient liquid assets to cover cash outflows for thirty days during the crisis period, and to fund their medium and long-term credit with stable fund that will sustain them during the crisis period (BCBS, 2008a, 2008b). This is to curtail excessive risk-taking and to ensure stability in the banking sector, particularly as it is documented that abundant funding liquidity was the root cause of the 2008-2009 GFC (Mairafi, Hassan, & Mohamed-Arshad, 2018a, 2018b). Meanwhile, Acharya and Naqvi (2012), Berger and Bouwman (2017), and Khan, Scheule, and Wu (2017) argued that abundant liquidity which stemmed from the large deposit inflow prior to the GFC has aggravated bank's high risk-taking in the US via the subprime mortgage system lending. Consequently, that had caused the high loan growth and loan concentration that ultimately triggered the crisis and led to the collapse of banks because of asset price bubbles, default and liquidity risk, the above policies are ex-post rather than ex-ante.

Scholars such as Acharya and Naqvi (2012), Allen and Gale (2000), Barlevy (2014), and Wagner (2007) documented that large liquidity inflow shield banks from funding liquidity risk and thus, aggravate their risk-taking behaviour by high risk in a pursue of short-term returns that will eventually lead to crisis. According to Sanusi (2011) the abundant liquidity that had led to the crisis were emanated from the large amount of deposit inflow from the

government large foreign exchange earned from the excess crude oil price and the proceeds of the 2005 consolidation and re-capitalization exercise. None of the above studies dealt with the problem of money supply and liquidity of commercial banks. Therefore this study examined the effect of money supply on the liquidity of commercial banks in Nigeria.

LITERATURE REVIEW

Money Supply

Money supply is the totality of cash and currency in circulation within a country refers to that country's money supply and it has a significant effect on the country's macroeconomic profile with respect to interest rates, inflation and business cycle. It is the amount of money which is available in an economy in sufficiently liquid and spendable form. Money supply is deemed to be in excess when the amount of money in circulation higher than the level of total output of the economy. When such a scenario subsists, it dislodges the stability of the price system, leading to inflation or situation of higher prices of goods.

The CBN changes the level of money supply in the Nigerian economy through the control of the monetary base (base money), which is made up of currency (notes and coins) outside the banking system plus the deposits of bank with the CBN. This is represented in the equation following:

$$MB = C + R \quad (1)$$

Where:

MB = Monetary base

C = Currency outside the banking system

R = Total commercial banks' vault cash and cash balances held with the central bank (Total reserves of the banking system)

If the CBN perceives there is too much money in circulation reflected by increase in prices (there is potential pressure for it to rise), it may reduce money supply by reducing base money. This it does by either selling financial securities to banks and the public or raising cash reserve requirements of deposit banks, which by extension will reduce their ability to create more money.

Some of the instruments used to control the monetary base in Nigeria include the Open market operations, the Monetary Policy Rate (MPR), the Minimum Reserve Requirement (MRR) and Special Deposits (SD). Whilst the MRR and SD can influence the level of statutory reserves of deposit money banks with the CBN, OMO and MPR only impact on the currency component of the monetary base (Onoh, 2007). It is thus pertinent at this juncture to understand what the constituents of money supply are.

Components of Money Supply

The Central Bank of Nigeria defines money supply in two ways, viz:

Narrow money (M1): This traditional approach to money supply gives the thinnest definition of what constitutes money supply in an economy and this includes currency in circulation with non-bank public and demand deposits in banks. Currency in circulation here refers to currency at the disposal of spending units while demand deposits are drawable deposits with banks these are so classified as they are easily used to consummate transactions. Algebraically, the M1 equation is given as;

$$M1 = CC + DD \quad (2)$$

Where:

CC = Currency in circulation

DD = Demand Deposit

Broad money (M2): This approach to money supply gives the broadest definition to the constituents of money supply within an economic space. It was put forward by Milton Friedman, a leader of the monetarists and comprises narrow money plus money market mutual fund shares, money market deposit accounts and time deposits. These are deposits with an explicit maturity of a few months to a few years, and with a penalty for early withdrawal (Blanchard, 2003). It measures the total volume of money supply in the economy, thus excess money supply (liquidity) may arise in the economy when the level of broad money within the system exceeds the total output in the economy. It is considered by economists to have a closer relationship to inflation and is used by the CBN in its implementation of monetary policy. Broad money movement in whichever direction indicating a rise or fall is a critical indicator that provides credible signals to the CBN on appropriate liquidity management measures to be taken. Broad money may be measured in different ways depending on the peculiarities in diverse economies as well as their varying levels of financial and economic development. These measurements are defined as M3, M4 and M5 due to its broader composition and frequent changes to its components, hence it is considered less stable than narrow money (CBN 2017). The M2 equation is given as:

$$M2 = M1 + SD + TD \quad (3)$$

Where:

M1 = Currency in circulation + Demand deposit
SD = Savings deposits with commercial banks
TD = Time deposits with commercial banks

Broad Money (M3): This is the Gurley and Shaw approach to giving a broadened definition of money supply. They view the constituents of money supply to include the liabilities of non-banking financial institutions since they are close to money. These liabilities are enumerated to include; savings banks, loans associations, mortgage, shares, bonds etc. They further emphasized that money supply is the allotment of weighted sums to these variables and that the allotment of weight should be based on substitutability of currency. This is done on the basis that higher weight is assigned to the component that is a perfect substitute to M1 component and a lower weight assigned to the imperfect component M3 ceteris paribus. The M3 equation is given as:

$$M3 = M2 + S + B \quad (4)$$

Where:

S = Shares of Credit Institutions
B = Bonds.

Broad Money (M4): This is the broadest definition to money supply, called the Central Bank view. The Central bank in addition to its traditional functions, determines the constituents of money supply. The Federal Reserve Bank of the USA (the American equivalent of the CBN) incorporated several other components into the definition of money supply. This definition of money is composed of M3 and other liquid assets like savings bonds, short term Treasury securities, Bankers' Acceptances, Commercial papers and Net of money market mutual holdings of assets. The M4 equation is given as:

$$M4 = M3 + SB + TS + BA + CP + M3H \quad (5)$$

Where:

SB = Savings Bonds
TS = Short term treasury securities
BA = Bankers' Acceptances
CP = Commercial papers
M3H = Net of money market mutual holdings of assets

Commercial Bank Liquidity

Liquidity is the word that the banks use to explain their ability to satisfy demand for cash in each rang for deposit it can also be deficit as the capacity of the bank to meet promptly demand that it pays its obligation (Yahaya, 2019). A bank is considered to be liquid when it has sufficient cash and other liquid assets to gather with the ability to raises funds quickly from the source to enable it to meet its payment obligation and financial commitments in a timely manner. In addition there should be a sufficient liquidity before to meet all mostly financial emergencies. How much liquidity to held and in what forms to hold it are a constant concern of bank management. Banks are required to comply with legal reserve requirement.

In addition banks need liquidity to meet seasonal and unexpected loan demands and deposit fluctuation. The majority of the traditions can be anticipate in advance and met from expected cash inflow from deposition repayment or earning. Cash reserves also are needs to take advantages to unexpected profit opportunities. Or for what might be farmed aggressive purposes when a business from which the banks has been working secure as a customer finally presents a loan application or a particularly desirable investment develops the banks must have funds available to seize these opportunities. During periods of expanding economic actively banks are frequently presented with attractive loan situation which can only be met if banks maintain adequate liquidity. To determine a banks need at a particular time is to fund the ration of loan to deposits. The higher the ration is the lees willing banks will be in lending out and vice versa.

Commercial Loan Theory

The essence of the theory is that short term loans are preferred by commercial banks as they will be repaid from the proceeds of transactions they facilitate and finance. A proposition that has been immensely subjected to criticism Dodds (1982) and Nwankwo (1992). Its antagonists argue that the theory is a deterrent to economic development especially for developing countries like Nigeria that require huge long-term funds to provide a big push for development. The commercial loan or the real bills doctrine theory states that a commercial bank should forward only short-term self-liquidating productive loans to business organizations. Loans meant to finance the production, and evolution of goods through the successive phases of production, storage, transportation, and distribution are considered as self-liquidating loans.

This theory also states that whenever commercial banks make short term self-liquidating productive loans, the central bank should lend to the banks on the security of such short-term loans. This principle assures that the appropriate degree of liquidity for each bank and appropriate money supply for the whole economy. The central bank was expected to increase or erase bank reserves by rediscounting approved loans. When business started growing and the requirements of trade increased, banks were able to capture additional reserves by rediscounting bills with the central banks. When business went down and the requirements of trade declined, the volume of rediscounting of bills would fall, the supply of bank reserves and the amount of bank credit and money would also contract.

Shiftability Theory

The shift ability theory is premised on the argument that banks' liquidity is a function of their capacity to acquire assets that are convertible or marketable to other lenders or investors should there be imminent need for cash, noting that the banks' assets should be marketable to the Central Bank and other financial institutions at discounted values. Thus this theory recognizes marketability or transferability of a bank's assets is a basis for ensuring liquidity.

This theory was proposed by H.G. Moulton who insisted that if the commercial banks continue a substantial amount of assets that can be moved to other banks for cash without any loss of material. In case of requirement, there is no need to depend on maturities. This theory states that, for an asset to be perfectly shiftable, it must be directly transferable without any loss of capital loss when there is a need for liquidity. This is specifically used for short term market investments, like treasury bills and bills of exchange which can be directly sold whenever there is a need to raise funds by banks. But in general circumstances when all banks require liquidity, the shiftability theory need all banks to acquire such assets which can be shifted on to the central bank which is the lender of the last resort.

Liquidity Management Theory

Liquidity management theory according to Dodds (1982) is a strategic plan on the acquisition of funds from depositors and other creditors, and the determination of an appropriate (term based) mix of such funds for a particular bank. It focuses on the liability side of bank balance sheet on the ground that supplementary liquidity could be derived from the liabilities of a bank. Nwankwo (1992) supports this position by arguing that given banks' capacity to purchase all requisite funds, it is inappropriate to have liquidity on the asset side (liquid asset) of the statement of financial position.

Anticipated Income Theory

This theory holds that banks' management of liquidity can be enhanced by adequate phasing and structuring of the loan commitments to the customers. According to Nzotta (1997) the theory focuses on the earning capacity and borrowers' credit worthiness as the ultimate guarantee for liquidity adequacy. It drives banks' transactions in self-liquidating commitments (Nwankwo, 1992); and encourages the adoption of ladder effects in investment portfolio of commercial banks (Ibe, 2013).

This theory was proposed by H.V. Prochanow in 1944 on the basis of the practice of extending term loans by the US commercial banks. This theory states that irrespective of the nature and feature of a borrower's business, the bank plans the liquidation of the term-loan from the expected income of the borrower. A term-loan is for a period exceeding one year and extending to a period less than five years.

It is admitted against the hypothecation (pledge as security) of machinery, stock and even immovable property. The bank puts limitations on the financial activities of the borrower while lending this loan. While lending a loan, the bank considers security along Bank Management with the anticipated earnings of the borrower. So a loan by the bank gets repaid by the future earnings of the borrower in installments, rather giving a lump sum at the maturity of the loan.

Empirical Review

Oji and Odi (2021) examined the effect of money market instruments on the liquidity of commercial banks in Nigeria using time series data sourced from Central bank of Nigeria Statistical Bulletin from 1987-2020. Liquidity of commercial banks was modeled as the function of treasury bills, treasury certificates, commercial papers, bankers acceptance, certificate of deposits and government bonds. Ordinary least square methods were used as data analysis methods. The study found that 37.9 percent variation in liquidity of commercial banks was traced to the money market instruments. The estimated model found that government bonds, banker acceptance and treasury certificate have negative effect on liquidity of the commercial banks within the periods of the study; the negative effect of the variables contradicts our a-priori expectation and justifies reforms in the Nigeria money market. The coefficient indicates that a unit increase in the variables reduces commercial

banks liquidity by 0.001, 0.29 and 0.39 percent. Commercial paper, certificate of deposits and treasury bills have positive effect on the liquidity of commercial banks such that a unit increase in the variables increases commercial banks liquidity by 0.05, 0.03 and 0.001 percent. The study concludes that money market does not really determine the liquidity of commercial banks in Nigeria.

Sulaiman (2020) examined the effect of money supply on private sector funding in Nigeria. The purpose of the study was to examine the extent to which monetary policy affect private sector funding in Nigeria. Time series data was sourced from Central Bank of Nigeria Statistical Bulletin from 1985-2018. Credit to private sector, credit to core private sector and credit to small and medium scale enterprises sector was used as dependent variables while narrow money supply, broad money supply, large money supply, private sector demand deposit was used as independent variables. Ordinary Least Square (OLS), Augmented Dickey Fuller Test, Johansen Co-integration test, normalized co-integrating equations, parsimonious vector error correction model and pair-wise causality tests were used to conduct the investigations and analysis. The empirical findings revealed that money supply explains 82.1 percent variation on credit to core private sector, 85.2 percent and 23.4 percent of the variation in credit to private sector and credit to small and medium scale enterprises sector. The study conclude that money supply has significant relationship with credit to private sector, credit to core private sector and credit to small and medium scale enterprises sector. From the findings, the study recommends that Central Bank of Nigeria should induce the variations of the amount of money changes through the nominal interest rates. That the monetary authorities should ensure adequate quantity of money supply that positively affect private sector funding in Nigeria.

Azu-Nwangolo (2018) examined the effect of financial deepening on customer deposit of Nigerian commercial banks. Time series data was sourced from Central Bank of Nigeria Statistical Bulletin, from 1981-2017. Percentage of total customers' deposit to total assets was used as dependent variables while percentage of narrow money supply, broad money supply, money market development, money outside the bank and private sector credit to gross domestic product was used as independent variables. Multiple regression with ordinary least square properties of cointegration, augment Dickey Fuller unit root test, Granger causality test and vector error correction model was used to examine the relationship between the dependent and the independent variables. The regression result found that narrow money supply and money market development have negative effect on total customer's deposit of commercial banks while private sector credit, broad money supply and money outside the bank have positive effect on customer's deposit of commercial banks in Nigeria. The unit root test shows that the variables are stationary at first difference; the cointegration test validates the existence of long run relationship while the causality test found no causal relationship. The study concludes that financial deepening has significant impact on total customer deposit. They recommended that policies should be deepened to enhance the performance of the Nigeria financial market.

Amassoma, Sunday and Onyedikachi (2018) empirically investigated the impact of money supply on inflation in Nigeria. The study was borne out of the curiosity to reexamine the immediate cause of the alarming rate of inflation in Nigeria which was adversely affecting the general welfare of Nigerian populace. Their study employed co-integration test and error correction approach on annual time series data spanning from 1970 to 2016. The study found that money supply does not considerably influence inflation both in the long and short run

possibly because the country was in a recession. The error correction model had the correct sign and was significant meaning that about 21% of the errors are corrected yearly. The Granger causality outcome demonstrates that, there was no causality between money supply and inflation in Nigeria.

Ofori, Danquah and Zhang (2017) examined the impact of money supply on inflation in Ghana. The trio used annual data from 1967-2015 to estimate their model. Their study was limited to money supply as independent variable and inflation as the dependent variable. The findings of their study showed a long-run positive relationship between money supply and inflation based on an Ordinary Least Squares. Diermeier and Goecke (2016) examined money supply and inflation in Europe: Is there still a connection found the following, (i) The formulation of an appropriate monetary policy for the heterogeneous country groups of the euro area remains a challenge, (ii) Controlling the money supply is now the last option remaining out of three monetary policy instruments, (iii) Monetary developments have become disconnected from inflation developments. At present a structural break exists for the various euro area countries, (iv) The ECB's asset purchase programme and the accompanying shift from long-term to short-term assets on banks' balance sheets is partly responsible for this development, (v) In the current regime of extremely low interest rates, there is a strong connection between the liabilities and lending of commercial banks and inflation for individual countries and (vi) Two problems stand in the way of a universally effective monetary policy in the euro area: real economy divergence and the different ways in which financial intermediation works in the different countries.

Obi and Uzodigwe (2015) supported the argument by monetarists who argue that inflation is essentially a monetary phenomenon in the sense that a continuous rise in the general price level is due to the rate of expansion in money supply far in excess of the money actually demanded by economic units. In their study, they assessed the dynamic linkage between money supply and inflation in ECOWAS member states; West African Monetary Zone (WAMZ) and West African Economic Monetary Union (WAEMU) from the period 1980 to 2012. They used both the univariate and panel sense, that is, KPSS and ADF; IPS and LLC to assess the stationary properties of the series. The random effect model for ECOWAS member states shows that the impact of money supply on inflation is effective in the current and first period. While the impact is effective in the first period for WAMZ, WAEMU experiences the impact in current period. They also found significant specific-country effects on the variables. Bonner, Lelyveld, and Zymek (2015) revealed significantly weak relationship amongst liquidity buffers, deposit liabilities, market concentration, and bank size in countries with bank liquidity regulations. Also, they maintained that liquidity regulation is a replacement for active liquidity mangement which by implication alleviate the bank risk-taking behaviour and ensure stability of banks. Bonner (2016) has shown that the LCR would help is ensuring the stability of banks in Netherlands. Bonner (2016) divulged that liquidity regulation has caused banks to increase their investments in government bonds and decrease their investments in loans. Thus, the liquidity standard relatively have effects on banks solvency as it controls the banks risk-taking behaviour on one hand, however, on the other hand it could have negative impact on the profitability of banks, since loans has been identified as the major source of revenue for banks. In addition, this may lead to assets concentration and eventually expose banks to liquidity risk.

King (2013) has identified that for banks to maintain a higher net stable funding ratio, they will have to pay higher interest expenses for borrowing more long-term funds. Thus, liquidity regulation may adversely affect the bank's profitability and increase their risk despite the associated public-sector gains from the reduction in disruptive bank failures across the society. This suggests that the new liquidity standards would have different effects on the banks' risk-taking behaviour across the world. Therefore, examining the effect across different markets and different is imperative for effective regulations of the banking system across the globe. In this regard, Umar and Sun (2016) revealed that the liquidity creation has a significant negative effect on funding liquidity in the BRICS. In other words, an increase in liquidity creation directly result in decrease in funding liquidity, and there is no evidence showing reversibility, which means that funding liquidity has not an effect on liquidity creation.

Fadare (2011) employed a linear least square model and time series data from 1980 to 2009 to study the determinants of banking sector liquidity in Nigeria and assess the extent to which the previous financial crisis affected liquidity in deposit money banks in Nigeria. Out of the five explanatory variables used for the study, only three regressors were found significant for predicting banking sector liquidity. They include loan-to-deposit ratio lagged one year, liquidity ratio, and monetary policy rate at $p = .002 < 0.05$ in each case. The remaining regressors are volatility of natural log of ratio of currency in circulation to total banking sector deposits and the volatility of the natural log of output to trend output as proxy for changes in the demand for cash for manufacturing and transactional purpose. The study finds that getting liquidity monetary policies right is crucial in ensuring the survival of commercial banks. It also discovers that lagged loan-to-deposit ratio, liquidity ratio and monetary policy rate are key monetary policy instruments for determining the extent of Nigerian banking sector credit.

Horvat, et al., (2012) conducted a study on Czech banks to find out the relationship between capital and liquidity creation. The authors carried out a series of Granger-Causality tests over the period 2000-2010. The results of the study create the impression that the requirements of Basel II can lead to the decrease of liquidity creation, while opining that greater liquidity creation can reduce banks' solvency. This exposes the trade-off between the benefits of financial stability generated by stronger capital requirements and the benefits of greater liquidity creation. Fadare identifies the work of Uremadu (2009) as the only relevant study which used several money and bankers' acceptance) in modeling a liquidity demand function for the Nigerian economy.

Literature Gap

Andreou et al. (2016) examined how managerial ability affects the banks' liquidity creation and their risk-taking behaviour. Their findings have shown that higher ability bank managers create more liquidity and take more risk. Conversely, during the period GFC, higher ability managers reduce liquidity creation as a way to de-leverage their balance sheets. Studies by Abdul (2017), Okoye, Adetiloye, Erin, and Evbuomwan (2017), Ibe (2013), Ejoh, Okpa, and Egbe (2014), Felicia and Ogunnaike (2012), Olokoyo (2011), and Zhao and Murinde (2011) have examined the impact of different factors that enhances banks liquidity on their performance as well as risk-taking. For example, Banking reform Okoye et al. (2017), Zhao and Murinde (2011), Nwosu et al. (2012), and Omowunmi (2012), Capital adequacy Abdul (2017) and Olalekan and Adeyinka (2013), Liquidity risk management Ibe (2013) and Ejoh et

al. (2014). However, these studies do not provide an in-depth analysis on how money supply affects liquidity of deposit money banks in Nigeria.

METHODOLOGY

This study adopted both quasi experimental research designs. The study used secondary data covering the period 1987-2021. Data were collected from Central Bank of Nigeria statistical bulletin. The main tool of analysis is the Ordinary Least Squares (OLS) using the multiple regression method for a period of 34 years, annual data covering 1987– 2021. Statistical evaluation of the global utility of the analytical model, so as to determine the reliability of the results obtained were carried out using the coefficient of correlation (r) of the regression, the coefficient of determination (r^2), the student T-test and F-test.

(i) **Coefficient of Determination (r^2) Test:** This measure the explanatory power of the independent variables on the dependent variables. R^2 gives the proportion or percentage of the total variation in the dependent variable Y that is accounted for by the single explanatory variable X. The higher the R^2 value the better. For example, to determine the proportion of monetary policy to private sector funding in our model, we used the coefficient of determination. The coefficient of determination varies between 0.0 and 1.0. A coefficient of determination says 0.20 means that 20% of changes in the dependent variable are explained by the independent variable(s). Therefore, we shall use the R^2 to determine the extent to which variation in monetary policy variables are explained by variations in private sector funding variables over the periods covered in this study.

(ii) **Correlation Co-Efficient (R):** This measures the degree of the relationship between two variables x and y in a regression equation. That is, it tries to establish the nature and magnitude of the relationship when two variables are been analyzed. Thus correlation co-efficient show whether two variables are positively or negatively correlated. That is, it takes the value ranging from – 1, to + 1.

(iii) **F-Test:** This measures the overall significance. The extent to which the statistic of the coefficient of determination is statistically significant is measured by the F-test. The F-test can be done using the F-statistic or by the probability estimate. We use the F-statistic estimate for this analysis.

(iv) **Student T-test:** measures the individual statistical significance of the estimated independent variables. This is a test of significance used to test the significance of regression coefficients (Gujurati, 2003). Generally speaking, the test of significance approach is one of the methods used to test statistical hypothesis. A test of significance is a procedure by sample results are used to verify the truth or falsity of a null hypothesis (Ho) at 5% level of significance.

(v) **Durbin Watson Statistics:** This measures the collinearity and autocorrelation between the variables in the time series. It is expected that a ratio of close to 2.00 is not auto correlated while ratio above 2.00 assumed the presence of autocorrelation.

(vi) **Regression coefficient:** This measures the extent in which the independent variables affect the dependent variables in the study.

(vii) **Probability ratio:** It measures also the extent in which the independent variables can explain change to the dependent variables given a percentage level of significant.

Model Specification

Components of money supply have implication on commercial bank liquidity. In this study, increase in commercial bank liquidity is conceptualized as the function of variation in money supply. We have therefore, chosen a combination of deductive and inductive analytical framework to achieve the objective of the study.

CLIQ= f(MS) (6)

Disaggregating equation 3.2, we have

CLIQ = f(M1, M2, M3,QM) (7)

Transforming equation 3.5 to econometrics form;

$$CLIQ = \lambda_0 + \lambda_1 M1 + \lambda_2 M2 + \lambda_3 M3 + \lambda_4 QM + \mu \quad (8)$$

Where

CLIQ = Liquidity of commercial banks measured as loan to deposit ratio

M1 = Narrow money supply as percentage of gross domestic product

M2 = Broad money supply as percentage of gross domestic product

M3 = Broad money supply as percentage of gross domestic product

QM = Quasi money as percentage of gross domestic product

μ = Error Term

$\beta_1 - \beta_4$ = Coefficient of Independent Variables to the Dependent Variables

β_0 = Regression Intercept

Unit Root Test

Given the non-stationarity characteristics of most macroeconomic variables, testing the properties of these variables has become relevant to avoid spuriousness of empirical result. In this view this study commenced its econometric analysis by conducting the stationary properties of the variables using the Augmented Dickey-Fuller tests.

The ADF test is based on estimating the equation below:

$\Delta Yt = \beta 1 + \beta 2t + \delta Yt\text{-}1 + \Delta Yt\text{-}1 + \mu t$ (9)

Where,

μt is pure white noise error; n is the maximum lag length on dependent variable to ensure that μt is the stationary random error.

$\Delta Yt\text{-}1 = (Yt\text{-}1 - Yt\text{-}2)$, $\Delta Yt\text{-}2 = (Yt\text{-}2 - Yt\text{-}3)$ and so on.

Note; that the number of lagged difference terms to include is often determined empirically, the idea is to include enough terms so that the error term is serially uncorrelated. And the ADF unit root test null hypothesis $\delta = 0$ is rejected if the t – statistics associated with the estimated coefficient exceeds the critical values of the test.

Cointegration Test

Given that the empirical model specified in the study is a multivariate model, the Engle – Granger (1987) co-integration test is inappropriate for testing co-integration among the variables. This is because the Engel – Granger approach is based on the assumption that there exist only one co-integrating vector that connect the variables and since our model is multivariate there is the possibility of having more than one cointegration vector. In the light

of the above weakness the Johansen cointegration test was applied. Johansen and Juselius (1990) tested proposes the use of two likelihood ratio tests namely, the trace test and the maximum eigen-values test. The trace statistic for the null hypothesis of cointegrating relations is computed as follows:

$\Gamma trace\ (r\backslash k) = -T\ (1- \lambda t)$ (10)

Where k is the number of endogenous variables, for r = 0, 1, k - 1.

Maximum eigen-value static tests the null hypothesis of r cointegrating relation against r + 1 cointegrating relations and is computed as follows:

$\Gamma max\ (r|r + 1) = -Tlog\ (1- \lambda r + 1)$ (11)

$= \Gamma trace\ (r|k) - \Gamma trace\ (r + 1|k)$ (12)

for r = 0, 1, . . . , k - 1.

The Error Correction Mechanism (ECM) from the cointegrating equations, is obtain by including the lagged error-correction term obtain from residual of the long run static model. This process helps in capturing the long-run information that might have been probably lost during the differencing. For the result to be consistent with theory, the coefficient of the error term should be negative and range between zero and one in absolute term. The error-correction term to be estimated represents the short-run to long-run adjustment equilibrium trends. It is a measure of the speed of adjustment of the short run relation to unexpected shocks. It is measured as the effects of residual from the long run model.

Table 1: Unit Root Test

Null Hypothesis: CLIQ has a unit root		t-Statistic	Prob.*	Order of Int	
Augmented Dickey-Fuller test statistic		-0.566787	0.4640	1(0)	0.464
Test critical values:	1% level	-2.636901			
	5% level	-1.951332			
	10% level	-1.610747			
Null Hypothesis: MI has a unit root					
Augmented Dickey-Fuller test statistic		-2.403234	0.9950	1(0)	0.99
Test critical values:	1% level	-2.636901			
	5% level	-1.951332			
	10% level	-1.610747			
Null Hypothesis: QM has a unit root					
Augmented Dickey-Fuller test statistic		-1.920504	0.9849	1(0)	0.98
Test critical values:	1% level	-2.636901			
	5% level	-1.951332			
	10% level	-			

		1.610747			
Null Hypothesis: M2 has a unit root					
				1(0)	
Augmented Dickey-Fuller test statistic		-2.802029	0.9982		0.99
Test critical values:	1% level	-2.636901			
	5% level	-1.951332			
	10% level	-1.610747			
Null Hypothesis: M3 has a unit root					
				1(0)	
Augmented Dickey-Fuller test statistic		-1.566436	0.9686		0.96
Test critical values:	1% level	-2.636901			
	5% level	-1.951332			
	10% level	-1.610747			

Stationarity Test (ADF at Difference)

Null Hypothesis: D(CLIQ,2) has a unit root					
				1(1)	
Augmented Dickey-Fuller test statistic		-8.060650	0.0000		0.00
Test critical values:	1% level	-2.641672			
	5% level	-1.952066			
	10% level	-1.610400			
Null Hypothesis: D(M1,2) has a unit root					
				1(1)	
Augmented Dickey-Fuller test statistic		-9.680510	0.0000		0.00
Test critical values:	1% level	-2.641672			
	5% level	-1.952066			
	10% level	-1.610400			
Null Hypothesis: D(QM,2) has a unit root					
				1(1)	
Augmented Dickey-Fuller test statistic		-6.770984	0.0000		0.00
Test critical values:	1% level	-2.644302			
	5% level	-1.952473			
	10% level	-1.610211			
Null Hypothesis: D(M2,2) has a unit root					

				1(1)	
Augmented Dickey-Fuller test statistic		-7.393804	0.0000		0.00
Test critical values:	1% level	-2.641672			
	5% level	-1.952066			
	10% level	-1.610400			
Null Hypothesis: D(M3,2) has a unit root					
				1(1)	
Augmented Dickey-Fuller test statistic		-6.637170	0.0000		0.00
Test critical values:	1% level	-2.641672			
	5% level	-1.952066			
	10% level	-1.610400			

Source: Author's Computations using E-View 9.0

The stationarity test result shows that all the variables are not stationary at level. The probability values are greater than the critical value of 0.05; therefore we conclude that there is no stationarity among the variables at level. From the results, the stationarity test at first difference shows that the variables are all integrated in order of 1(1), the probability values are less than the critical value of 0.05 which means the variables are significant, the null hypothesis is rejected.

Table 2: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.687074	101.9022	69.81889	0.0000
At most 1 *	0.543296	63.56320	47.85613	0.0009
At most 2 *	0.430693	37.70043	29.79707	0.0050
At most 3 *	0.324845	19.11039	15.49471	0.0136
At most 4 *	0.169967	6.147577	3.841466	0.0132
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.687074	38.33898	33.87687	0.0137
At most 1	0.543296	25.86277	27.58434	0.0817
At most 2	0.430693	18.59004	21.13162	0.1093
At most 3	0.324845	12.96281	14.26460	0.0794
At most 4 *	0.169967	6.147577	3.841466	0.0132
1 Cointegrating Equation(s):		Log likelihood	-457.2175	
Normalized cointegrating coefficients (standard error in parentheses)				
LIQ	M1	M2	M3	QM
1.000000	-2.464084	2.268068	0.089644	-2.369716
	(0.64980)	(0.64662)	(0.03428)	(0.66032)

Source: Author's Computations using E-View 9.0

Maximum Eigen value test indicates at least four cointegrating equation at 5% level denoting rejection of null hypotheses at 5% level of significance. The results of Johansen maximum likelihood cointegration tests reported in table above indicate one cointegrating equation at full-rank trend. To this extent, the results provide good evidence of multicollinearity among the time cointegration.

Table 3: Error Correction Estimate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.257728	0.514306	-1.295677	0.2061
M1	1.864951	0.732092	3.253526	0.0031
QM	-0.409939	0.422482	-0.530938	0.5998
M2	0.282102	0.113757	2.469850	0.0322
M3	0.112892	0.704525	1.428764	0.1645
ECM(-1)	0.235679	0.193003	1.221116	0.2326
R-squared	0.797822	Mean dependent var		16788.37
Adjusted R-squared	0.760381	S.D. dependent var		15199.98
S.E. of regression	7440.521	Akaike info criterion		20.83024
Sum squared resid	1.49E+09	Schwarz criterion		21.10233
Log likelihood	-337.6989	Hannan-Quinn criter.		20.92179
F-statistic	21.30910	Durbin-Watson stat		1.871771
Prob(F-statistic)	0.000000			

Source: Author's Computations using E-View 9.0

From the estimated regression model, the results above prove the relationship between money supply and the liquidity of commercial banks as formulated in the model. The R^2 of 0.760381 indicate that money supply explained 76% variation in liquidity of commercial banks in Nigeria while the remaining 24% is traceable to exogenous variables not captured in the model. The F-statistics of 21.30910 and the probability of 0.000000 proved the significance of the model. The Durbin Watson statistics of 1.871771 is less than 2.00; therefore there is the presence of serial autocorrelation between the variables in the time series. The estimated regression model proved that narrow money supply have positive and significant effect, quasi money have negative but no significant effect, broad money supply (M2) have positive and significant effect while broad money supply (M3) have positive but no significant effect on the liquidity of commercial banks over the periods of the study.

Discussion of Findings

The estimated regression model found that money supply variables explained 76 percent variation in commercial banks liquidity in Nigeria. The regression model was judged statistically significant by the value of F-statistic and probability. The study found that narrow money supply have positive and significant effect on liquidity of commercial banks such that a unit increase added 1.8 percent to liquidity of commercial banks while broad money supply (M2) and M3 added 0.11 percent to liquidity. The positive effect of M1, M2 and M3 on the liquidity of commercial banks confirms the expectations of the study and in line with financial sector reforms such as the deregulations of the financial market in the last quarter of 1986. Empirically the positive effect of the variables contradicts the findings of Oji and Odi (2021) that money market does not really determine the liquidity of commercial banks in Nigeria but confirm the findings of Sulaiman (2020) that money supply has significant relationship with credit to private sector, credit to core private sector and credit to

small and medium scale enterprises sector and the findings of Azu-Nwangolo (2018) that financial deepening has significant impact on total customer deposit.

Furthermore, the study found that quasi money has negative but no significant effect on the liquidity of commercial banks, the findings indicated that quasi money reduced liquidity of commercial banks by 0.4 percent within the periods of the study, the negative effect of quasi money contradict the a-priori expectations of the study and could be blamed informal financial sector and the increasing rate of money outside the banking system.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Findings of the study revealed that money supply explained 76% variation in liquidity of commercial banks in Nigeria while the remaining 24% is traceable to exogenous variables not captured in the model and further proved that narrow money supply have positive and significant effect, quasi money have negative but no significant effect, broad money supply (M2) have positive and significant effect while broad money supply (M3) have positive but no significant effect on the liquidity of commercial banks over the periods of the study. From the findings, the study concludes that narrow money supply have positive and significant effect on the liquidity of commercial banks, Quasi money have negative but no significant effect on the liquidity of commercial banks, broad money supply (M2) have positive and significant effect on the liquidity of commercial banks while broad money supply (M3) have positive but no significant effect on the liquidity of commercial banks, the null hypothesis is accepted.

Recommendations

From the findings, the study makes the following recommendations:

i. The monetary authorities should ensure adequate money supply in the economy as this determine the liquidity of the financial market at large and policies should be deepened the operations of deposit money banks to ensure that money supply goes through the banking sector.
ii. There is need to regulate access to money through electronic channels as frequent cash withdrawals affect negatively the liquidity of the deposit money banks.
iii. The money authorities should strengthen the spread of deposit money banks for effective mobilization of money outside the banking system such as the rural banking and rural financial intermediation.
iv. It recommends that regulatory authorities and the money market institutions should formulate policies that enhance operational efficiency of the money market for better liquidity of the deposit money banks.

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