LIQUIDITY AND ASSET QUALITY MANAGEMENT: EVIDENCE FROM LISTED DEPOSIT MONEY BANKS IN NIGERIA

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Abstract: *The study examines the relationship between liquidity management and asset quality of listed Deposit Money Banks (DMBs) in Nigeria. Ex post facto research design was used for the study. Secondary data were sourced from audited annual reports of fourteen (14) listed DMBs, Nigeria Deposit Insurance Corporation (NDIC) and Nigeria Stocks Exchange (NSE). The data were analyzed using panel data regression analysis. Time series annual data for sixteen (16) years spanning 2005-2020 were used for the study. Data on liquidity management and asset quality were proxies with short-term fund to total deposit (CSD) and loans to total deposit (LTD) respectively. Findings showed that the ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) positively and negatively influenced the returns on investment (ROI) of DMBs under investigation. It was concluded from the study that, liquidity management (LIM) has both positive and negative relationship with asset quality (ASQ) of the DMBs. The study therefore recommends that management of banks should comply with regulations guiding lending and credit administration to avoid the increasing incidence of nonperforming loans. Also, the regulatory authorities without bias, should regularly access the lending behavior of the banking industry, by ensuring that credit policies are strictly integrated with liquidity and profitability objectives of the DMBs.*

Keywords: Liquidity Management, Asset Quality, Total Loans, Total Deposit, Cash and Short Term Fund, Deposit Money Banks

1.0. Introduction

A mounting level of non-performing loans (NPLs) and inefficient management of liquidity in the banking sector can severely affect the economy in many ways. Regulators are increasingly concerned about perceived high levels of risk in the liquidity profiles of banks due largely to high volume of nonperforming loans (NPLs). No doubt, there are apparent conflicts between the objectives of liquidity, safety and profitability relating to commercial bank. And, this conflict will persist unabated in as much as Deposit Money Banks (DMBs) does not shy away from their intermediation responsibility. Liquidity and asset quality management of banks are very germane in effective delivery on the three major objectives of DMBs. Liquidity refers to a bank's ability to meet its demand, savings and time deposit withdrawals as and when such withdrawals are demanded or are due Adegoke and Oyedeko (2018). Liquidity also includes the bank's ability to meet loan requests that have been considered profitable and safe (Emefiele 2015).The Basel Committee on Banking Supervision, in its June 2008 consultative paper, defined liquidity as the ability of a

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bank to fund increases in assets and meet obligations as they become due, without incurring unacceptable losses. More recent studies such as those by (Drehmann and Nikolaou 2013; Bai, Krishnamurthy and Weymuller 2014; Krishnamurthy, Bai and Weymuller 2016 and Onaolapo and Adegoke 2020) have emphasized that the correct definition and measure of liquidity should capture the multidimensional aspects of liquidity.

The unprecedented outbreak of Covid 19 pandemic in the year 2019 and the resulting economic fallout and actions by Federal Government led to plunging market rates and a flood of liquidity into the financial system. Bank portfolio managers have been inundated with excess cash but find themselves with dramatically lower reinvestment yields. This situation made most bankers to believe that asset quality will worsen over the coming months. In anticipation of likely deteriorating position, bank management needs to take steps to safeguard their liquidity position for the future. They cannot ignore the risk-management best practices of evaluating the current liquidity and ensuring that adequate and diversified sources will be available if needed. These forces require banks to more effectively manage asset allocation across their portfolios to improve returns on capital while still maintaining adequate liquidity. Against this backdrop, the main objective of this study is to empirically determine the relationship between liquidity management and asset quality of deposit money banks in Nigeria. In line with this objective, the research question, how does liquidity management relate with asset quality of Nigerian DMBs will be answered through the remaining part of this paper. The paper is structured into literature review of liquidity management and asset quality in section two, section three outlines the methodology adopted for the study, data analysis and discussion were presented in section four while section five concludes the paper and proffer recommendations.

2.0 Literature review

2.1 Conceptual Review and Theory

Liquidity management is a bank's programmes or strategies to be able to meet deposit and loan demands. Such strategies include holding of short-term financial assets like treasury bill and certificates, which are highly marketable, maintaining avenues for short-term accommodation from the Central Bank or other banks and through mobilization of greater volume of deposits. According to Davronov (2016), liquidity management are the mechanisms employed to maintain the efficiency and stability of DMBs and the banking system as well. It involves the strategic supply or withdrawal from the market or circulation the amount of liquidity consistent with a desired level of short-term reserve money without distorting the profit making ability and operations of the bank. Liquidity management must of necessity involve aggressive liquidity planning. Unfortunately, adequate liquidity planning is lacking in many Nigerian DMBs. Few banks are able to plan for short, medium and long-term liquidity needs. To plan well, banks must be able to forecast future funds' demand and deposit supplies. Therefore, improved liquidity planning, greater drive for deposits and injection of fresh capital has been avenues available for banks to overcome frequent liquidity crises.

As delicate as improper liquidity management has been found to be, poor asset quality constitutes the major cause of most bank failures Grier (2007). A most important asset category is the loan portfolio; the greatest risk facing the bank is the risk of loan losses derived from delinquent loans. Asset quality is one of the most critical areas in determining the overall condition of a bank. In fact, it is one of the most notable criteria in evaluating performance of DMBs. The primary factor affecting overall asset quality is the quality of the loan portfolio and the credit administration program. Loans typically comprise a majority of a bank's assets and carry the greatest amount of risk to their capital. An upward trend

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in the non-performing loans ratio has generally been acknowledged as a harbinger of banking sector distress and/or failures. Deterioration in this ratio was implicated in the 1996-1998 banking distress in Pakistan (Hardy and Banaccorsi di Patti, 2001; Nandy 2010), in the Indian banking crisis (Mohan 2005), the 1994-1995 Mexican financial crisis (Sidaoui 2007) as well as the instability of banking in Ghana before 2000 (Ziorklui 2001). Unsustainable high levels of non-performing loan ratios have been a major contributor to every episode of banking distress, banking sector crisis and bank failures in Nigeria (Onaolapo 2008). The correlation between the NPL ratio and the health of a bank and of the banking sector at large is straight forward. A high NPL ratio depresses bank profitability and erodes bank capital base (Onaolapo and Ajala2013). The erosion of capital base leads to capital inadequacy, the threat of insolvency and an invitation to forbearance action(s) by banking regulators.

The Commercial Loan Theory or Real Bills Doctrine originated in England during the 18th century where Adam Smith was of the opinion that real bills were a vital asset that commercial banks needed to purchase and hold. It is also referred to as the real bills doctrine and is of English origin. Historically, liquidity management focused on assets and was closely tied to credit policies. Prior to 1930, the commercial loan theory encouraged banks to make only short-term, self-liquidating loan facilities. Such loans closely matched the maturity of bank deposits and enabled banks to meet deposit withdrawals with funds from maturing loans. Logical basis of the theory is that commercial bank deposits are near demand liabilities and should have short term self-liquidating obligations (Emmanuel 1997). Bankers long ago recognized the advantage of making self-liquidating loans (otherwise known as real bills, or claims on real resources) in order to resolve the liquidity-earnings problems. A loan was considered self-liquidating if it was secured by goods in the process of production or by finished goods in transit to their final destination for resale. The loan could be repaid after the goods were sold. Loans of this type could ensure the banks continuous liquidity and earn profits. This meant that, liquidity and earnings were simultaneously gained. However, no loan is truly automatically self-liquidating, because there may not be a ready market for the goods produced.

The shift ability theory of bank liquidity was propounded by Moulton (1918) who asserted that if the commercial banks maintain a substantial amount of assets that can be shifted on to the other banks for cash without material loss in case of necessity, then there is no need to rely on maturities. According to this view, an asset to be perfectly shiftable must be immediately transferable without capital loss when the need for liquidity arises. This is particularly applicable to short term market investments, such as treasury bills and bills of exchange which can be immediately sold whenever it is necessary to raise funds by banks. But in a general crisis when all banks are in need of liquidity, the shiftability theory requires that all banks should possess such assets which can be shifted on to the central bank which is the lender of last resort. This theory has certain elements of truth. Banks now accept sound assets which can be shifted on to other banks. Shares and debentures of large companies are accepted as liquid assets along with treasury bills and bills of exchange. This has encouraged term lending by banks. This theory has its weaknesses. For instance, mere shiftability of assets does not provide liquidity to the banking system. It entirely depends upon the economic circumstances.

2.2 Theoretical framework

According to Adeusi, Akeke, Adebisi & Oladunjoye (2014), liquidity risk, credit risk and operational risk are some of the common types of risks faced by the financial institutions. Risk has been mentioned as an essential part of business without which an organization can't grow. Loss of a bank coming from

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inability to fulfill financial obligations to various stakeholders such as customers reflected the risk of liquidity (Adegoke and Oyedeko, 2018). Whereas, delay in case of repayment of loanis reflected through credit risk (Djan, Stephen, Bawuah, & Halidu, (2015). Oru & Odumusor (2019) had highlighted the necessity of using liquidity risk, credit risk and operational risk for the reasons behind challenges faced by DMBs inNigeria. Rewane (2019) found the merger of Access Bank Plc and Diamond Bank Plc behind the level increment of liquidity. Hence, it can be easily said that liquidity management is directly related with the effective use of assets(Robinson, Henry, Pirie and Broihahn2015). For Oru and Odumusor (2019), liquidity management theory helps to manage firm's lendings to its subsidiaries. It is also known as the real bills doctrine, as it impacts both bank lending and general economic activities. To this end, this study is predicated on the Commercial Loan Theory or Real Bills Doctrine

2.3 Empirical framework

Khalid (2012) examined the impact of asset quality on the profitability of private banks in India using Return on Asset as profitability variable for the period 2006 – 2011, operating performance of the sample banksis estimated with the help of financial ratios. Multiple regression models were employed to examine if banksasset quality and operating performance are positively correlated. The result showed that a bad asset ratio isnegatively associated with banking operating performance after controlling for the effect of operating scale,traditional banking business concentration and the idle fund ratio. The result further support the hypotheses thatthe higher the quality of the loan processing activities before loan approval, the lower the non-valued-addedactivities that is required to process problematic loans, and thus the higher the banking operating performance will be. Arif (2012) tested liquidity risk factors and assessed their impact on (22) of Pakistani banks during period (2004-2009). Findings of the study indicate that there is a significant impact of liquidity risk factors on the banks profitability, where an increase in deposits lead to increase in the bank's profitability in terms of reducing dependence on the central bank in meeting the customers' obligations, and profitability is negatively affected by the allocation of non-performing loans and liquidity gap. Ezeoha (2011) used panel data from 19 out of a total 25 banks operating in Nigeria; where he uses a multivariate constant coefficient regression model to test whether consolidation heighten incidence of non-performing credit in a fragile banking environment. He find that there is deterioration in asset quality and the deterioration in asset quality and increased credit crisis between 2004 and 2008 was exacerbated by the viability of bank to optimally use their huge asset capacity to enhance their earnings profiles. This implies that excess liquidity syndrome and relatively huge capital bases fueled reckless lending by banks portfolio ironically helped to mitigate the level of nonperforming loans within the studied period.

Onaolapo (2012) while analyzing the credit risk management efficiency in Nigerian commercial banking sector from 2004 through 2009 provides some further insight into credit risk as profit enhancing mechanism. They used regression analysis and found rather an interesting result that there is a minimal causation between deposit exposure and bank's performance. The study by Kehinde (2013) critically examined the relationship between credit management, liquidity position and profitability of selected banks in Nigeria using annual data of ten banks over the period of 2006 and 2010. The results from ordinary least squares estimate found that liquidity has significant positive effect on Return on Asset (ROA). Agbada and Osuji (2013) examined empirically the effect of efficient liquidity management on banking performance in Nigeria. Findings from the empirical analysis were quite robust and clearly indicate that there is significant relationship between efficient liquidity management and banking

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performance and that efficient liquidity management enhances the soundness of bank. Ibe (2013) examined the effect of liquidity management on the profitability of banks in Nigeria. He found that liquidity management is indeed a critical issue in the banking sector of Nigeria. The effect of liquidity management on banks' profitability has been studied by a number of researchers; here are some review of them. Abata (2014) examined assets quality and bank performance of six largest banks quoted in Nigeria stock exchange using secondary data sourced from the annual reports of the commercial banks for fifteen years(1999 – 2013). The study adopted the use of ratios as a measure of bank performance and asset quality since it is a verifiable means for gauging the firms level of activities while the data were analyzed using the Pearson correlation and regression tool of the SPSS 17.0. The findings revealed that assets quality has a statistically relationship and influence on bank performance.

Thus, an overview of the above literature shows that there are quite a few studies that examined the impact of liquidity and asset quality on performance of DMBs in Nigeria. However, there are no study that emphatically determines the relationship between liquidity management and asset quality. Also, data in this study was captured from 2005 up to 2020 which was important and pertinent aftermath of consolidation of 2005, banking crisis of 2008 and Covid 19 crisis of 2020. Thus, gaps were created that necessitates further research on the relationship that exists between liquidity management and asset quality of DMBs in Nigeria. Hence the current study is meant to establish the relationship between liquidity management and asset quality of DMBs in Nigeria..

3.0 Methodology

Ex post facto research design was used for the study. The study made use of secondary data sourced from the annual reports of fourteen 14 listed DMBs in Nigeria, Nigeria Deposit Insurance Corporation (NDIC) and Nigeria Stock Exchange (NSE) annual reports over a period of 16 years spanning 2005-2020. The estimation techniques used to test the relationship between the variables includes the unit root test, panel least square and vector autoregressive estimates among others.

3.1 Variable Description and Measurement
Table 3.1. Measurement of variables

S/N	Variables	Code	Types	Measurements	Source
1	Asset Quality	ASQ	Dependent Variable	Ratio of loan loss provision to total loan	Lemma (2017)
2.	Liquidity Management	LIQ	Independent Variable	Ratio of total loan to total deposit, CSD is ratio of cash and short-term fund to total deposit,	Das (1996).
3.	Bank Size	BSZ	Control variable	Logarithm of total asset	Kariuki, Muturi, and Ngugi, (2016)

Source: Various Empirical Studies (2020)

3.2 Model Specifications

The objective is to determine the relationship between Liquidity Management and Asset Quality of DMBs in Nigeria. The specification draws a relationship between asset quality, ratio of total loan to total deposit, and ratio of cash and short-term fund to total deposit. Thus, the model of interest for this study is discussed under the static and dynamic frameworks. The former comprises the pooled, fixed and random effect regression model, w 3.1 e latter deals with dynamic model. The model is similar to that of Abrigo and Love 2015.

$$ASQ_{it} = \pi_0 + \lambda_1 LTD_{it} + \lambda_2 CSD_{it} + \lambda_3 BSZ + \varepsilon_{it0} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.15$$

$$ASQ_{it} = \pi_0 + \lambda_1 LTD_{it} + \lambda_2 CSD_{it} + \lambda_3 BSZ + u_i + \varepsilon_{it1} \dots\dots\dots\dots\dots\dots\dots\dots 3.2$$

$$ASQ_{it} = \pi_0 + \lambda_1 LTD_{it} + \lambda_2 CSD_{it} + \lambda_3 BSZ + w_i + \varepsilon_{it2} \dots\dots\dots\dots\dots\dots\dots\dots 3.3$$

Where ASQ is asset quality, LTD is ratio of total loan to total deposit, CSD is ratio of cash and short-term fund to total deposit, BSZ is the bank size which serves as a control variable, λ_1-λ_3 represent the coefficients of the variables, ε represents the error term, π_0 represent the constant, i is the deposit money banks and t is the time frame in the study, ui is the specific fixed effect, wi is the specific random effect and ε is the idiosyncratic shock or individual observation error term.Dynamic model for asset quality, ratio of total loan to total deposit, and ratio of ash and short-term fund to total deposit.is specified below;

$$ASQ_{it} = \pi_{01} + \lambda_{11}ASQ_{it-1} + \dots \lambda_{1p}ASQ_{it-p} + \lambda_{12}LTD_{it-1} + \dots \lambda_{1p}LTD_{it-p} +$$
$$\lambda_{13}CSD_{it-1} + \lambda_{1p}CSD_{it-p} + \lambda_{14}BSZ_{it-1} + \lambda_{1p}BSZ_{it-p} + f_i + d_i + \varepsilon_{it1} \qquad 3.4$$

$$LTD_{it} = \pi_{01} + \lambda_{11}ASQ_{it-1} + \dots \lambda_{1p}ASQ_{it-p} + \lambda_{12}LTD_{it-1} + \dots \lambda_{1p}LTD_{it-p} +$$
$$\lambda_{13}CSD_{it-1} + \lambda_{1p}CSD_{it-p} + \lambda_{14}BSZ_{it-1} + \lambda_{1p}BSZ_{it-p} + f_i + d_i + \varepsilon_{it1} \qquad 3.5$$

$$CSD_{it} = \pi_{01} + \lambda_{11}ASQ_{it-1} + \dots \lambda_{1p}ASQ_{it-p} + \lambda_{12}LTD_{it-1} + \dots \lambda_{1p}LTD_{it-p} +$$
$$\lambda_{13}CSD_{it-1} + \lambda_{1p}CSD_{it-p} + \lambda_{14}BSZ_{it-1} + \lambda_{1p}BSZ_{it-p} + f_i + d_i + \varepsilon_{it1} \qquad 3.6$$

$$BSZ_{it} = \pi_{01} + \lambda_{11}ASQ_{it-1} + \dots \lambda_{1p}ASQ_{it-p} + \lambda_{12}LTD_{it-1} + \dots \lambda_{1p}LTD_{it-p} +$$
$$\lambda_{13}CSD_{it-1} + \lambda_{1p}CSD_{it-p} + \lambda_{14}BSZ_{it-1} + \lambda_{1p}BSZ_{it-p} + f_i + d_i + \varepsilon_{it1} \qquad 3.7$$

The a priori expectation are ASQ > 0, LTD < or > 0, CSD < or > 0, BSZ > 0

4.0 Results and Discussion

The only hypothesis tested in the study is thatliquidity management has no significant effect on asset quality of Nigerian DMB. The table 4.1below showed the descriptive analysis for this objective, which is to determine the relationship between liquidity management and asset quality of the DMBs in Nigeria for the period 2005-2020. The asset quality (ASQ) of the DMB was captured by ratio of total loan to total deposit (LTD), while liquidity management was proxied with ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ). The result revealed on average that, the asset quality (ASQ), ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit

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(CSD) and bank size (BSZ) of the DMB to be 0.150, 6.254, 0.430 and 12.422 percent respectively. The maximum & the minimum value for the asset quality (ASQ), ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) of the DMB were: 5.921 & -0.013, 14.336 & 0.375, 1.940 & 0.056 and 15.600 & 5.056 percent respectively. The standard deviation values of 0.625, 2.095, 0.273 and 2.582 revealed the rate at which the asset quality (ASQ), ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) of the DMB were been deviated from their respective expected value. Also, it was discovered that the skewness of the asset quality (ASQ), ratio of total loan to total deposit (LTD) and ratio of cash and short-term fund to total deposit (CSD) of the DMB were positively skewed with skewness coefficient

of 7.304, 0.562 and 2.507 respectively. Thus, the variables had a distribution with a long tail to the right while bank size (BSZ) with skewness coefficient of -1.190 was negatively skewed and thus have a distribution with a long tail to the left. However, the kurtosis of the financial variables showed that the asset quality (ASQ), ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) of the DMB with kurtosis coefficient index of 60.410, 4.289, 11.462 and 3.627 were mesokurtic in nature. The Jarque-Bera and probability values revealed that the asset quality (ASQ), ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) of the DMB were statistically significant in examining the effect of liquidity management on asset quality of DMB.

Table 4.1: Descriptive Analysis showing the relationship between liquidity management and   asset quality

	ASQ	LTD	CSD	BSZ
Mean	0.149657	6.254456	0.430440	12.42206
Median	0.019685	6.110605	0.359068	13.20519
Maximum	5.920929	14.33625	1.940459	15.59986
Minimum	-0.012946	0.375220	0.056372	5.056246
Std. Dev.	0.625011	2.095499	0.272878	2.581763
Skewness	7.304222	0.562343	2.506669	-1.189891
Kurtosis	60.41015	4.288622	11.46174	3.627250
Jarque-Bera	28659.55	23.89128	789.9998	49.46388
Probability	0.000000	0.000006	0.000000	0.000000
Observations	224	224	224	224

Source: Researchers' Computation, 2021

The correlation coefficients presented in table 4.2 below showed the degree or the extent of relationship that exist between the liquidity management and the asset quality of DMBs under investigation in Nigeria. From the table 4.2, it was discovered that a positive correlation exist between the asset quality (ASQ) and ratio of the cash

and short-term fund to total deposit (CSD) with correlation coefficient of 0.002 while a negative correlation exist between the asset quality and the ratio of total loan to total deposit (LTD) as well as asset quality and bank size (BSZ) of the DMB with the correlation coefficient of -0.201 and -0.328 respectively.

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A positive correlation was also discovered between the ratio of the cash and short-term fund to total deposit (CSD) and bank size (BSZ) of the DMB with the correlation coefficient of 0.24 while, a negative correlation exist between the ratio of the cash and short-term fund to total deposit (CSD) and the ratio of total loan to total deposit (LTD) and the ratio cash and short-term fund to total deposit (CSD) and the bank size (BSZ) of DMB with the correlation coefficient of -0.034 and -0.19 respectively.

Table 4.2: Correlation Matrix

VARIABLES	ASQ	LTD	CSD	BSZ
ASQ	1.000000	-0.200825	0.001606	-0.328336
LTD	-0.200825	1.000000	-0.033778	0.247952
CSD	0.001606	-0.033778	1.000000	-0.191046
BSZ	-0.328336	0.247952	-0.191046	1.000000

Source: Researchers' Computation, 2021

The panel unit root test presented in the table 4.3 below showed that all the variables were stationary. The asset quality (ASQ), ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) were all stationary at cross section level during the period under investigation. This was revealed as the probability of Levin, Lin and Chur t statistic values showed 0.001, 0.000, 0.000 and 0.000 respectively. At the individual level, the Augmented Dickey Fuller (ADF) test statistic values 0.031, 0.001, 0.006 and 0.003 for each of the financial variables which were less than the probability of the error margin 0.05 allowed for the estimate in this study, revealed the stationarity of liquidity management and asset quality. Thus, it implies that a short run equilibrium relationship exist among the financial variables under investigation to examine the effect of liquidity management on asset quality of the DMB in Nigeria. Hence, short run stability was established between the liquidity management and asset quality as revealed by the panel unit root test.

Table 4.3: Panel unit root test at level for the variables

Variables	Levin, Lin & Chu t* Statistic	Prob	ADF Statistic	Prob	PP Statistic	Prob
ASQ	-2.90192	0.0019	43.4089	0.0318	75.5999	0.0000
LTD	-6.01334	0.0000	57.2540	0.0009	28.2569	0.4509
CSD	-3.98421	0.0000	50.6494	0.0055	71.5480	0.0000
BSZ	-5.59866	0.0000	52.6139	0.0033	155.941	0.0000

Source: Researchers' Computation, 2021

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Table 4.4 below showed the result of the pooled, fixed and random effect panel regression for the effect of liquidity management measured by ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) on asset quality (ASQ) of DMB in Nigeria. It was discovered from the result that a linear relationship exist between the ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) and asset quality (ASQ) of DMB in Nigeria. Specifically, the result of the three panel model showed that liquidity management has both positive and negative relationship with asset quality (ASQ) of the DMBs under consideration. The Adjusted R-squared of 0.613, 0.615 and 0.642 for the pooled, fixed and random effect models showed that 61.3, 61.5 and 64.2 percent variation in the

profitability of the DMBs in Nigeria can be explained by the liquidity management captured by the ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) under consideration. The result implies the significance of the ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) in enhancing the asset quality of DMB in Nigeria. Above all, the probability of the F- statistics 0.000, 0.000 and 0.001 < 0.05 indicated that the pooled, fixed and random effect panel models were statistically significance, reliable, appropriate and acceptable for examining the relationship between liquidity management and asset quality of DMBs in Nigeria.

Table 4.4: Panel Least Square Models

Dependent Variable: ASQ						
Method: Panel Least Squares						
Sample: 2005 2020						
Periods included: 16						
Cross-sections included: 14						
Total panel (balanced) observations: 224						
	Pooled effect		Fixed effect		Random effect	
Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	1.374724	0.0000	-1.761646	0.0075	1.116071	0.0001
LTD	-0.031768	0.0131	-0.025016	0.0205	-0.028020	0.0017
CSD	-0.141216	0.3707	0.197275	0.2657	-0.103498	0.5024
BSZ	-0.074754	0.0000	0.159698	0.0021	-0.060011	0.0035
Effects Specification						
					S.D.	Rho
			Cross-section random		0.128984	0.0538
			Idiosyncratic random		0.540910	0.8462
	Cross-section Pooled		Cross-section fixed		Cross-section random	
Bank 2	-		-0.238549		-0.029853	
Bank 1	-		-0.351088		-0.005436	

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Bank 10	-	-0.502555	-0.028915	
Bank 11	-	-0.354749	-0.018108	
Bank 4	-	-0.487018	0.006563	
Bank 3	-	0.387394	-0.128474	
Bank 9	-	-0.157220	-0.044764	
Bank 13	-	-0.012885	-0.037794	
Bank 12	-	0.181410	0.062315	
Bank 7	-	0.517282	-0.062174	
Bank 6	-	-0.348445	-0.010059	
Bank 14	-	-0.513905	-0.003699	
Bank 8	-	-0.206120	-0.005039	
Bank 5	-	2.086449	0.305437	
R-squared	0.626660	0.632467	0.657691	
Adjusted R-squared	0.613014	0.615112	0.642967	
F-statistic	92.81884	50.84452	39.18238	
Prob(F-statistic)	0.000009	0.000000	0.000577	

Source: Researchers' Computation, 2021

Table 4.5 showed the result of vector autoregressive model for examining the dynamic of liquidity management in relation to the asset quality (ASQ) of the DMBs in Nigeria with the coefficient of parameters and (standard error). It was discovered that the asset quality at lag one (ASQ (-1)), ratio of total loan to total deposit at lag one (LTD (-1)) and ratio of cash and short-term fund to total deposit at lag one (CSD (-1)) under consideration had a direct relationship with the current level of asset quality (ASQ) of the DMBs in Nigeria. While, bank size at lag one (BSZ (-1)) under consideration had an inverse relationship with the current level of asset quality (ASQ) of the DMB s in Nigeria.The result further revealed that one percent improvement of the asset quality at lag one (ASQ (-1)) and the ratio of total loan to total deposit at lag one (LTD (-1)) and ratio of cash and short-term fund to total deposit at lag one (CSD (-1)) under consideration led to an increase in the current level of asset quality (ASQ) of the DMBs under consideration by 1.02, 0.006 and 0.014 percent respectively. Thus, liquidity management is imperative for examining the asset quality of DMB which in turn affected the expected return from the asset.This study revealed that asset quality at lag one (ASQ (-1)) and ratio of cash and short-term fund to total deposit at lag one (CSD (-1)) under consideration of the DMBs in Nigeria were inversely related with the current level of the ratio of total loan to total deposit (LTD). Thus, the asset quality at lag one (ASQ (-1)) and ratio of cash and short-term fund to total deposit at lag one (CSD (-1)) reduced the current level of total loan to total deposit (LTD) by 2.626 and 2.693 percent respectively. Also, it was revealed that one percent increase in the ratio of total loan to total deposit at lag one (LTD (-1)) and bank size at lag one (BSZ (-1)) under consideration led to an increase in the current level of loan to total deposit (LTD) of DMBs in Nigeria to the turn of 0.604 and 0.670 percent respectively.

The result further indicated that the asset quality at lag one (ASQ (-1)) and the ratio of total loan to total deposit at lag one (LTD (-1)) and bank size at lag one (BSZ (-1))

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under consideration led to a decline in the current level of the ratio of cash and short term fund to total deposit (CSD) of the DMBs under consideration in to the turn of 0.015, 0.002 and 0.008 percent respectively. While, the ratio of cash and short term fund to total deposit at lag one (CSD (-1)) increased the current level cash and short term fund to total deposit (CSD) by 0.502 percent. Furthermore, it was discovered that the asset quality at lag one (ASQ (-1)), ratio of cash and short-term fund to total deposit at lag one (CSD (-1)) and bank size at lag one (BSZ (-1)) under consideration led to an increase in the current level of the bank size (BSZ) of the DMBs under study to the turn of 0.033, 0.111 and 0.988 percent respectively. While, the ratio of total loan to total deposit at lag one (LTD (-1) led to decline in the current level of the bank size (BSZ) by 0.0004 percent respectively.An examination of the significance of vector autoregressive model using Adjusted

R-Square revealed that 62.2, 42.2, 35.5 and 98.3 percent variations or changes in the current level of asset quality (ASQ), the ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) of DMB in Nigeria can be explained by their respective lag value. Moreover, the test for the overall significance or the adequacy of the autoregressive model done using F-statistic showed that the F-statistic values of 75.309, 33.979, 25.944 and 2615.540 > 2.65, the critical value at 5 percent level of significance and thus revealed the appropriateness and adequacy of the vector autoregressive model in examining the dynamic effect of liquidity management in relation to asset quality of the DMB in Nigeria. This result led to test for the stability condition of the VAR model and the results were presented in the table 4.6 and figure 4.1 underneath.

Table 4.5: Vector Autoregressive Estimates

Vector Autoregression Estimates				
Sample (adjusted): 2006 2020				
Included observations: 210 after adjustments				
Standard errors in ( )				
	ASQ	LTD	CSD	BSZ
ASQ(-1)	1.024042	-2.626381	-0.015092	0.033112
	(0.06586)	(2.61703)	(0.03329)	(0.05539)
LTD(-1)	0.005672	0.603851	-0.001546	-0.000368
	(0.00148)	(0.05882)	(0.00075)	(0.00124)
CSD(-1)	0.013620	-2.692679	0.502302	0.110908
	(0.10775)	(4.28204)	(0.05447)	(0.09062)
BSZ(-1)	-0.032592	0.669874	-0.008209	0.987887
	(0.01266)	(0.50290)	(0.00640)	(0.01064)
C	0.065025	18.18606	0.393691	0.329263
	(0.18595)	(7.38953)	(0.09400)	(0.15639)
R-squared	0.629889	0.434355	0.369606	0.983363
Adj. R-squared	0.621525	0.421572	0.355359	0.982987
Sum sq. Resids	27.94859	44136.35	7.141879	19.76903
S.E. equation	0.397368	15.79107	0.200872	0.334200

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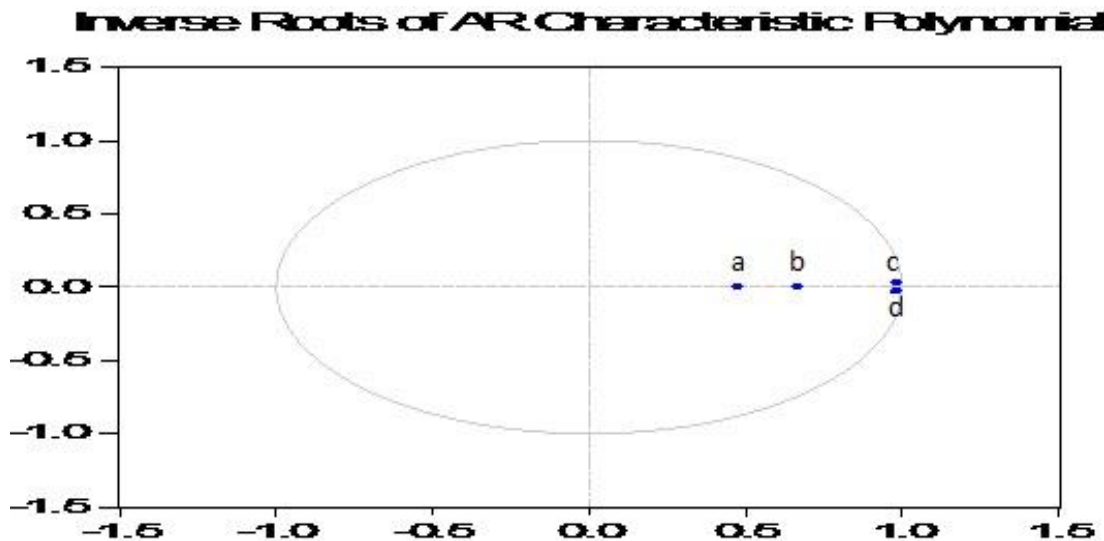| F-statistic	75.30887	33.97932	25.94415	2615.540
Log likelihood	-87.74559	-757.9308	36.41399	-56.23679
Akaike AIC	1.019182	8.383854	-0.345209	0.672932
Schwarz SC	1.107204	8.471877	-0.257186	0.760954
Mean dependent	0.153062	62.61744	0.412572	12.55886
S.D. dependent	0.645914	20.76286	0.250185	2.562243

Source: Researchers' Computation, 2021

The result in table 4.6 and figure 4.1 showed the vector autoregressive stability condition check for the dynamic relationship in asset quality (ASQ) and the liquidity management (LIM) captured by the ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) of the DMBs in Nigeria. From the result, it was discovered that all the roots or the eigen values a, b, c and d were less than one and were within the unit circle. This result showed that a linear relationship exist between the ratio of total loan to total deposit (LTD), ratio of cash and short-term fund to total deposit (CSD) and bank size (BSZ) and asset quality (ASQ) of DMBs in Nigeria. This indicates that liquidity management has both positive and negative relationship with asset quality (ASQ) of the DMBs under consideration. This result conforms with the findings of Abata (2014) and satisfies the a priori expectations. The result can be used for policy formulation and implementation with regard to liquidity management and asset quality of DMBs in Nigeria.

Table 4.6: Vector Autoregressive Model Stability Condition Check

Roots of Characteristic Polynomial	
Endogenous variables: ASQ LTD CSD BSZ	
Exogenous variables: C	
Lag specification: 1 1	
Root	Modulus
0.984611 - 0.029286i	0.985046
0.984611 + 0.029286i	0.985046
0.669390	0.669390
0.479470	0.479470

Source: Researchers' Computation, 2021

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Figure 4.1: Diagrammatic representation of VAR Model showing stability condition of the dynamic relationship among variables.

Source: Researchers' Computation, 2021

5.0 Conclusion and Recommendation

The study concluded that liquidity management has both positive and negative relationship with asset quality of the DMBs under consideration. This indicates that management of DMBs needs to place more emphasis on credit risk management through efficient monitoring of loans and non-performing loan (NPL) so as to enhance the quality of assets thereby impacting positively on the profitability of DMBs in Nigeria. In similar vein, management of banks needs to pay more attention on mobilization of cheap and sustainable deposits and maintain reasonable level of liquidity to meet customers' cash and loan requirements.The study therefore recommends that liquidity and credit risk management should be viewed as part of a coordinating group effort made by all department involved with customers to reduce bad debtors and improve the quality of assets.There is the need for bank management to reevaluate the effectiveness of risk-management system with the view to articulate and support itsbelief in the bank's current risk position (both short and long term); the extent to which various components contribute to or affect risk; and the expected risk/reward implications of potential strategies. In this vein, the board of the banks should set risk appetites, approve frameworks, policies and processes for the management of risk, and accept risks beyond the approval discretion provided to management.

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APPENDIX
NAMES OF SAMPLED LISTED DEPOSIT MONEYBANKS

S/N	NAME OF BANKS
1.	Access Bank Plc
2.	Diamond Bank
3.	Ecobank

4.	First Bank of Nigeria Plc
5.	First City Monument Bank
6.	Guaranty Trust Bank
7.	Polaris Bank Plc
8.	Stanbic IBTC Bank
9.	Sterling Bank
10.	United Bank for Africa
11.	Union Bank
12.	Unity Bank
13.	Wema Bank
14.	Zenith Bank

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