# *Original Research Article*

## DOES FINANCIAL DEEPENING CAUSE LIQUIDITY PROBLEMS FOR BANKS? EVIDENCE FROM NIGERIA

**KAYODE, Peter Akinyemi[1]; AJAYI, David Adelagun[2] and AWOSUSI, Charles Temitope[1]**

**1 Department of Banking and Finance, Adekunle Ajasin University, Akungba-Akoko, Nigeria**
**2 Auditing Department, Rufus Giwa Polytechnic, Owo, Nigeria**

**ABSTRACT**

Attempt to facilitate economic growth makes the Central Banks to formulate monetary policies that seek to deepen the provision of financial resources to target sectors. Since Banks are the main channels through which monetary policies are executed, we attempted to examine whether financial deepening cause liquidity problem among Nigerian banks in this study. We employed time series analytical techniques to analyze selected financial deepening indicators and data for banking system liquidity between 1981 and 2019. The financial deepening variables used include of broad money to the gross domestic product (GDP) ratio; credit to private sector to the GDP ratio; ratio of commercial banks liabilities to the GDP; financial sector contribution to the GDP and ratio of market capitalization to the GDP. On the other hand, the liquidity of the banking system is proxy by its loan/deposit ratio for the period under study. We estimated the statistical properties of the variables examined and conducted some pre-estimation tests (stationarity and co-integration) to ascertain choice estimation techniques. We used a vector error correction mechanism to investigate long and short-run effects of financial deepening on Nigerian banking system liquidity. Both the long run vector autoregressive (VAR) and the short run and vector error correction (VEC) models results showed that there is a positive but statistically insignificant relationship between banking system liquidity and financial deepening variables. In addition, the results of the Granger causality between the dependent and independent variables revealed that there exists no causal relationship between the liquidity of the banking system and financial deepening. These findings imply that financial deepening did not impair banks' liquidity position in Nigeria during the years under review. The study concluded that financial deepening does not cause liquidity problem for banks in Nigeria; rather, if well managed, can have positive effect on it. In the light of this, the study recommends that banks should re-strategize in the implementation of financial deepening policies that are liquidity friendly and that the Central Bank of Nigeria, should formulate policies that will not only focus on credit and loan beneficiaries, but also on the banks.

Key words: Financial deepening, Bank liquidity, VAR, VECM, Causality

# 1. INTRODUCTION

The intermediation role of the banking system is crucial to the growth and development of the economy. The system plays a major role in the provision of credit to the productive sector of the economy. The provision of adequate funds for economic growth is termed financial deepening. When banks grant credits, they make more money available for investments in the various sectors of the economy. Such credit can be to the private, public sector or households. The extent to which such funds are utilized depends, largely, on the borrowers. In Nigeria, the Central Bank of Nigeria, every year determines what the volume of money in the circulation should be. This it does by formulating various measures aimed at controlling the availability, cost, and direction of credits from the banks to the various sectors of the Nigerian economy.

Nigerian banks are primary in the execution chain of the CBN policies that target enhancing financial deepening in the economy. There is no gainsaying in the fact that the banks themselves may not necessarily agree with such policies since they may feel threatened by them. Nonetheless, they are bound by law to execute them as specified by the CBN. As noted by [1] monetary policy does not necessarily cause problem for banks in Nigeria as most of them want the public to believe. Economic growth and development depend largely on the availability of investible funds. One primary focus of the CBN is to make sure that the banking system provides adequate funding to important sectors of the economy. Annually, the Central Bank churns out various directives and guidelines to which other banks are required to strictly adhere to facilitate the country's achievement of its economic growth objectives.

The periodic monetary policy and credit guidelines issued by the CBN specify, among other things, the prescribed interests on loans and savings, cash reserve ratio, minimum rediscount rate, minimum credit to the private sector in the banks' loan portfolio and sectoral allocation of funds. These prescriptions are meant to control the cost, volume, direction and utilization of money and credit in the economy [2].

The role of the banking system in meeting these objectives cannot be overemphasized as they are the main facilitators of monetary policy and credit guidelines. In implementing the CBN directives, the banking industry is usually sandwiched between maintaining internal liquidity and meeting the prescriptions. In most cases, the goal of internal liquidity conflicts with financing productive investments.

Statutorily, the banks are required to adhere to the monetary policy guidelines as given by the CBN, yet, they must maintain a healthy internal liquidity to remain in business. [3] present an argument to support the argument that attempt to ensure financial deepening may occasion more cut-throat competition among banks in such that they start to have lower profit margin and increased financial fragility. [4] look at effect of financial deepening from the risk perspective by arguing that efforts by banks to contribute considerably to financial deepening can cause financial illiquidity if they undertake excessive risks.

[5] as well as [6], in presenting the financial repression hypothesis, theorized that monetary authorities and policies can strangulate the financial system if care is not taken. In fact, they argue that financial institutions will contribute more to economic growth when monetary

authorities do not interfere in their operation. In their view, banks and non-bank financial institutions may find it difficult to perform well in the face of intense regulation by the regulatory authorities.

Researchers have not reached a consensus on how financial deepening impacts banks' performance in general. There is currently a dearth of empirical literature regarding how bank liquidity affects financial deepening in Nigeria. Greater attention has hitherto been placed on banks' profitability – financial deepening relationship, on one hand, and role of the banking system in financial deepening on the other. Other empirical works have also attempted to prove whether it is financial development that spurs economic growth or vice-versa.

The focus of this research is different in that it departs from the more popular financial deepening versus economic development literature. The study is borne out of the need to ascertain whether financial deepening causes illiquidity in banks, especially because banks are the executors of the nation's monetary policies and the CBN hardly gives waivers to banking firms with peculiar operational challenges in the implementation of its monetary policies and guidelines. To the best of the researcher's knowledge, not much has been done to empirically examine how financial deepening influences liquidity position of Nigerian banking firms. Also, not much research has been done to examine the causal relationship between Nigerian banks' liquidity position and financial deepening. It is in the light of these gaps that this article is out to determine if and how financial deepening affect liquidity position of quoted commercial banks in Nigeria.

## Objectives of the Study

Specifically, the study addressed the following objectives:

i. Examine the short-run effect of financial deepening on Nigerian commercial banks' liquidity
ii. Ascertain the long-run relationship between financial deepening and Nigerian commercial banks' liquidity
iii. Ascertain whether financial deepening have causal relationship with Nigerian commercial banks' liquidity

## Research Hypotheses

Based on the identified objectives, the following null hypotheses are tested in line with the stated objectives:

i. Financial deepening has no short-run significant effect on commercial banks liquidity in Nigeria
ii. Financial deepening has no long-run significant effect on commercial banks liquidity in Nigeria
iii. There is no causal relationship between financial deepening and liquidity of Nigerian commercial banks

## 2. LITERATURE REVIEW

### 2.1 Financial Deepening

Banks exist primarily to perform intermediation role between the ultimate lenders and the ultimate borrowers. The ultimate lenders of funds, also called the surplus unit, presently have

more than they require for investment while the ultimate borrowers are the deficit units, which need more than that they currently have for investment and consumption. The banking system mobilizes the funds from surplus unit and channels it to deficit unit as credits at a given consideration called interest. Making these funds available for economic development is called financial deepening. [7] asserted that "financial intermediaries play a crucial role of intermediation in the growth process by transferring funds from net savers to net borrowers, influencing investment and economic growth" thus improving its resource base and the needed capital that propels productivity.

[8] defines financial deepening in terms of the share of the economy attributable to financing efforts of financial markets, institutions, and policies. Succinctly, [8] stated that it comprises of the financial sector vis-à-vis the whole economy measured by size of financial institutions, quantity and quality of financial instruments plus the effect of of financial markets.

[9] define financial deepening as when the quantity, costs/price, condition and risks faced by intending borrowers of funds are favourable and investment friendly. [5]'s definition of the concept of financial deepening can be summarized as the accumulation of financial resources given a rate that is faster than the accumulation of nonfinancial assets and output. [8], however goes further in explaining the concept of financial deepening as the increased and improved condition, quantity and options of available financial services which are also accessible to potential borrowers in the productive activities.

How then is do we measure financial deepening? [10] believes a proper metric of financial deepening should incorporate assets of financial institutions, their liquid liabilities, credit to private sector (CPS) and stock market capitalization. [11] maintains that defining financial deepening should basically include ratio of CPS to GDP as well as ratio of broad money supply (M2) to the GDP. [12] criticize the use of CPS as a measure of financial deepening. The authors argue that the CPS fails to recognize the heterogeneous nature of credit demand in different countries. They cited the cases of Korea and Vietnam which have similar values of CPS/GDP ratio, but large difference in terms of access to banking.

**2.2 Bank Liquidity**

Liquidity refers to the feature of an asset being able to be transformed into cash within the shortest possible time, but bank liquidity refers to its ability to meet its financial obligations as and when due. [13] defines a bank' liquidity as its ability to meet present cash demand at minimal or no loss at all. This means that if banks are seen as healthy, they must remain liquid despite the pressing demand on them by potential borrowers, regulatory authorities and other investments opportunities.

[14] carried out a robust literature review of Nigerian banking system liquidity. The authors noticed that although bank liquidity has received much attention in financial literature empirical studies have concentrated on developed economies with less attention on emerging and developing ones. They submitted that among banks, liquidity standard lessens "banks' risk-taking behaviour since it requires the banks to maintain more liquid assets, as such it affected their performance as it reduced the amount of liquidity creation

4

Deciphering the position of [15], while banks manage their resources and liabilities, risks relating to liquidity, the market, credit, operations, reputation often arise which they must efficiently manage to remain in business. [16] posits that when banks fail to meet the cash demand on them as they fall due, they are illiquid.

## 2.3 Theoretical Review

The connection between financial deepening and economic development is one of the main topical issues in economics and finance. Attention has been on the argument on whether it is financial development that induces economic growth or vice-versa. Two divergent theories were propounded by [17] namely, the supply leading hypothesis and the demand following hypothesis. These hypotheses are concerned with the direction of causal link between financial deepening and economic growth.

[17] posits that a unidirectional causation exists from financial development to economic growth, implying that improvements in financial markets, instruments and institutions will induce improved supply of finance, which will undoubtedly lead to improved productivity in real sector of the economy. This scenario is termed "supply leading hypothesis". This hypothesis comprises of two processes: the transfer of resources from low growth sectors to high growth sectors; and the promotion of entrepreneurial response in the high growth sector.

Scholars emphasize the importance of financial institutions in economic growth [5}, [6] and [18] argue that the industrialization process in England was promoted by the transformations in the financial sector which increased the access of the government and people to funds that were used to finance capital projects. This led to expansion of the economy.

[17] also proposed another scenario in the financial-real sector development process – the demand following scenario where a uni-directional causality exists between financial system and economic growth which runs from real to financial sector growth. This he termed the demand-following hypothesis. The implication of this hypothesis is that financial institutions passively respond to economic (real) growth in such a way that when these is increasing demand for financial services, there will be development of the financial system as the real sector grows. Also [17] suggested a third hypothesis known as the stage of development hypothesis. The "stucturalists" hypothesis emphasizes the imperfections in the banking system and deficiencies on the demand side of financial system in the initial stages of economic development. This hypothesis posits that as the relative backwardness of the economic increases, the role of the banks in industrial capital formation declines.

Another underlining theory related to financial deepening is the Financial Repression Hypothesis (FPH) spearheaded and popularized by the works of [19], [6] and [5]. This hypothesis posits that financial development will contribute sufficiently to economic growth if and only if the authorities are not to interfere in business of financial institutions. Both government agencies and financial regulatory authorities should stay off from unduly regulating the affairs of the financial system. It explains that poor performance by banks would be due to interest rate regulation; interest ceilings; official prudential guidelines and other control measures that hinder free intermediation

## 2.4 Empirical Review

While ample literature exists on the impact of financial deepening and Nigeria's economic growth, on one hand, and on banks' performance, on the other, empirical studies that address its effect on banks' liquidity is scanty. In assessing how financial deepening impacts on financial system stability in Nigeria, including its liquidity, [20] found a positive and strong relationship between the latter and the former. The author further affirmed that financial deepening remained a potent weapon in fiscal policy reforms between 1989 and 2017. [21] examines the performance of orthodox banks in Pakistan to ascertain whether financial repression affect the performance of the banks. The researcher finds that financial indices have significantly negative effects on financial deepening. In Nigeria, [22] examine how financial deepening influenced selected deposit money banks' performance in Nigeria. The researchers use descriptive and Ordinary Least Square (OLS) analysis to investigate effects of financial depth ratios on banks' profitability. Their findings show that the three financial deepening variables exert positive and significant effect on banks' performance. [23] examine the degree of causation between financial depth and some macroeconomic variables in Nigeria. The study analyzes the 1970–2013 data of financial and GDP data using the Toda–Yamamoto Augmented Granger causality test and discovers that the causality between real and financial growth in Nigeria supports the: supply-leading hypothesis".

Several works have been done to investigate the nexus between financial and real sector growth in Nigeria. Among the studies that discover positive and significant relationship between them are [24], [25], [26] and [27], among others. Yet [28] having examined if changes in the financial structure explain economic growth dynamics in Nigeria using VECM finds that changes in financial structure in Nigeria do not particularly have any significant consequential effects on its real growth rate. However, [29] while analyzing the connexion between economic growth and financial deepening ratios in Nigeria, find mixed results. Their findings reveal that though along run relationship exists between economic growth, broad money and banks advances to private sector, broad money supply exerts a positive and insignificant effect on economic growth whereas private sector credit has negative and insignificant effect on economic growth. None of the financial deepening variables have a causal relationship with economic growth. A very recent study by [30] in Viena was conducted to examine the effect of Central Bank's monetary policies on credit creation ability of banks. The authors analyzed data of 46 Vietnamese banks spanning 2007 t0 2017 with panel and two-staged least squares regression. Among their findings was that a tight monetary policy may curtail banks' liquidity creation ability.

## 3. RESEARCH METHOD

### 3.1 Model Specification

This study is based on the "financial repression hypothesis" (FPH) advocated by [6] and [5] as discussed in the literature review. Our in this study is a modification of the one employed by [8] in his study on the impact of financial deepening on economic development/growth in Kenya. Here, we employ Time \series analytical techniques to ascertain the effects of financial

deepening on banks' liquidity in Nigeria. This study was carried out to examine the effect of five financial deepening variables on the liquidity position of Nigerian banks. The data used are annual Time Series data obtained from the CBN annual Statistical Bulletin for the years under study.

Generally, the relationship to be examined in our study is

LIQ = f(FD) …………………..(3.1)

which is stated in a model form as:

LIQ = $\mho_0$ + $\mho_1$FD$_{it}$ + $\varepsilon_{it}$ ……….. (3.2)

where LIQ = Liquidity of the banking system.

FD = financial deepening variables

Note that FD comprises of five financial deepening ratios, namely M2/GDP; CPS/GDP; BSC/GDP; CBL/GDP and MCAP/GDP, so that the comprehensive model now becomes

LIQ = $\mho_0$ + $\mho_1$M2/GDP$_{it}$ + $\mho_2$CPS/GDP$_{it}$ + $\mho_3$BSC/GDP$_{it}$ + $\mho_4$CBL/GDP$_{it}$ + $\mho_5$MCAP/GDP$_{it}$ + $\varepsilon_{it}$ ……………………………… (3.3)

Where:

M2/GDP = Broad money supply/gross domestic product (GDP) ratio

CPS/GDP = Credit to private sector/GDP ratio

BSC/GDP = Banking sector contribution/GDP ratio

CBL/GDP = Commercial banks' liabilities/GDP ratio

MCAP/GDP = Ratio of market capitalization to gross domestic product

$\mho_{i,}$…. $\mho_5$ = Regression parameters

$\varepsilon_{it}$ = Stochastic error term

We gathered data from secondary sources. All the data are extracted from the annual Statistical Bulletin of the Central Bank of Nigeria.

## 3.2 Estimation Techniques

We used descriptive statistics, [31] (PP) unit root test and the Johansen (1988) co-integration test to determine the choice of appropriate estimation techniques for data analysis. A variable is said to be stationary if its mean, variance and covariance are time invariant while it is co-integrated when there is long-run relationship between it and other variables in a model.

The long-run effect is expressed as variations in these two vectors as:

$$\Delta(\text{LIQ})t = \mho0 + \mho1(\text{LIQ})t-1 \; \mho2(\text{FD})t-1 + \sum_{t=1}^{p} \mho3\Delta(\text{LIQ})t-1 + \sum_{t=1}^{p} \mho4\Delta(\text{FD})t-1 + \sum_{t=1}^{p} \mho4\Delta(\text{LIQ})t-1$$
$$+ \sum_{t=1}^{p} \mho5\Delta(\text{FD})t-1 + \varepsilon it \;………… (3.4)$$

Where:

$\Delta$ = difference operator

$\mho_1$ … $\mho_2$ = long-run relationship parameters

$\mho_3$ … $\mho_5$ = short-run effects parameters and

$P$ = maximum lag length

According to [32], two variables are co-integrated when they also possess an error correction feature. The use of Error Correction Model (ECM) is meant to reveal long and short run effects of the variables and show the speed of adjustment between the variables when the error correction term is included in the equation.

The ECM is expressed as:

$$\Delta(LIQ)t = \mho 0 + \sum_{t=1}^{p} \mho 1\Delta(LIQ)t - 1 + \sum_{t=1}^{p} \mho 2\Delta(FD)t - 1 + \mho 3ECTt = 1 + \varepsilon it \ldots\ldots\ldots\ldots (3.4)$$

where:

$\mho_3$ = error correction term coefficient

The post estimation tests employed in this study include the Dubin Watson test of serial autocorrelation, the *F-Statistic* test of model reliability, the residual normality, residual heteroskedasticity and the recursive residuals tests. The test of causation between bank liquidity and financial deepening variables was also done with Granger causality test. Theoretically, a direct and positive relationship is expected between banks' liquidity and financial deepening variables. It is expected that M2/GDP; CPS/GDP; CBL/GDP; FSC/GDP and MCAP/GDP are all positively related to LIQ

## 4. Results and Discussion

### 4.1 Descriptive Statistics

Appendix 1 shows the descriptive statistics that reveal the normality or otherwise of distribution of the variables studied.

Of particular attention is the Jarque-Bera probability that is statistically expected to be close to zero for a data set to be normally distributed. Thus, the null hypothesis to be tested under the Jarque-Bera normality test is that selected variables are not normally distributed (JB ≠ 0). The decision rule is not to reject our null hypothesis if the JB probability falls below the 5% significance level and vice-versa.

From the normality test, the Jarque-Bera probabilities for LIQ, M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP are 0.224582, 0.090525, 0.031144, 0.220556, 0.001743 and 0.000109 respectively. This implies that three of the variables (LIQ, M2/GDP and CBL/GDP) have coefficients which are greater than the 5% significance, hence they are normally distributed; while the other three (CPS/GDP, FSC/GDP and MCAP/GDP) are not normally distributed with probabilities less than 5%. This implies that the three variables that are normally distributed (LIQ, M2/GDP and CBL/GDP) have data that are symmetric around the mean, that is data that are close to mean that occur more frequently while the other three (CPS/GDP, FSC/GDP and MCAP/GDP) do not.

The coefficients of skewness are -0.690191, 0.707337, 0.969376, 0.643275, 1.299095 and 1.385763 for LIQ, M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP respectively. This implies that only LIQ with skewness of -0.690191 is skewed to the left of the normal distribution while the remaining five financial deepening variables are right-skewed, that is, the distribution right tail is longer that the left.

Finally, the coefficients of kurtosis for LIQ, M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP are 2.820893, 1.944073, 2.138748, 2.447018, 4.220810 and 5.038800 respectively. Only the coefficient of LIQ is around the rule of thumb kurtosis of 3 for normal distribution to take place which indicates that LIQ is normally distributed as previously confirmed by the JB normality test. This connotes that apart from variables such as FSC/GDP and MCAP/GDP with kurtosis greater than 3 are leptokurtic (with heavy tails vis-à-vis normal distribution) and others such as M2/GDP, CPS/GDP, CBL/GDP with kurtosis less than 3 are platykurtic (with thin tails vis-à-vis normal distribution).

## 4.2 Correlations

From Appendix 2, all the financial deepening variables have moderately positive low correlations with bank liquidity [(0.279225 (228%); 0.215473 (22%); 0.193276 (20%); 0.409419 (41%) and 0.356732 (36%)] for M2_GDP, CPS_GDP; CBL_GDP; FSC_GDP and MCAP_GDP respectively. This implies that though the financial deepening variables are positively correlated with bank liquidity, the degree of correlation is mild

## 4.3 Test of Stationarity (Unit Root)

The Philip Perron (PP) unit root test is used to test for the stationarity of each of the variables in this study. The decision on whether a variable is stationary is based on the comparison between the critical values and the PP t-statistics at 99% (1%), 95% (5%) and 90% (10%) levels of significance. If the calculated PP t-statistics is greater than the critical value, the null hypothesis (non-stationarity) cannot be accepted and vice-versa. Table 1 contains the extracts from unit root tests carried out on each of the variables.

From Table 1, it is shown that all the variables under study are stationary at first difference, that is, the variables have no unit root so our null hypothesis cannot be accepted. The outcome of the unit root tests provides the basis for a test of co-integration, especially because all the variables are stationary at 1(1) – first difference.

## 4.4 Test of Cointegration

The Johansen cointegration method employs Trace and Maximum Eigen tests to arrive at decisions regarding long-run relationship among variables under study. The decision rule is to compare the Trace and the Maximum Eigen statistics with the critical values. If the former is less than the latter, the null hypothesis cannot be rejected. Appendices 3 and 4 contain the Trace and the Max-Eigen tests results.

As revealed in Appendix 3, the Trace statistics show that, at 5% significant level, three of the explanatory variables (M2/GDP; CPS/GDP and CBL/GDP are cointegrated with LIQ, meaning that the null hypothesis of no single equation cannot be accepted.     Equally, the Max-Eigen test results shown in Appendix 4 reveals that at least one cointegrating equation exists between LIQ and M2/GDP; LIQ and CPS/GDP; and LIQ and CBL/GDP. In summary, results of the Johansen cointegration test through the Trace and Max-Eigen tests show that long-run relationships exist between liquidity and financial deepening indicators.

## 4.5    Short Run Relationship Results (Error Correction Models)

Table 2 contains the short run regression (ECM) results for the dependent variable and each of the independent variables. The estimation of the short-run relationship is done by generating the error correction term for each of the model.

Estimated short-run models in Table 2 show that the coefficients of M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP are 1.638327, 1.334209, 1.041786, 0.445722 and 0.131196 respectively. These coefficients are all positive and conform to the *a priori* expectation of positive relationship between bank liquidity and financial deepening. However, none of these positive effects is statistically significant in the short-run. Notwithstanding, all the probabilities of *F-Statistics* are less than 5% significance level, implying that each of the models is valid and reliable.

In the short-run, a unit increase in M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP will cause an increase of 1.638327, 1.334209, 1.041786, 0.445722 and 0.131196 in LIQ respectively. The error correction terms, an indicator of the speed with which the variables adjust to equilibrium, for LIQ and M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP models are: -0.913813, -0.950655, -0.908852, -0.382192, and -0.429250 respectively. This means that about 91%, 95%, 91%, 31% and 43% of the previous year's deviance from the mean are corrected in the new year. But none of the probabilities of these error correction terms imply that they are statistically significant. They are all greater than 5% significance level. All these further confirm the conclusion derived from the results of VAR concerning the relationship linking liquidity and financial deepening variables that financial deepening indicators have positive but insignificant effect on liquidity.

## 4.6 Long-Run Regression Estimation Results (Vector Autoregressive, VAR)

To establish the nature of long-run relationship between the dependent and independent variables, we must first find the *p* value in the unrestricted vector autoregressive. The maximum lag is determined by the Schwarz criterion. Tables 3 show results of long-run regression models comprising of the dependent and independent variables.

Table 5 show that, on the long-run, a unit increase in M2/GDP; CPS/GDP; CBL/GDP; FSC/GDP and MCAP/GDP will propel an increase of 1.175365, 0.979107, 0.885076, 0.441593 and 0.188669 in LIQ respectively. However, the probabilities of t-Statistics, which are 0.3121, 0.3166, 0.1158, 0.8724 and 0.6105 (all greater than 5%) for M2/GDP; CPS/GDP; CBL/GDP; FSC/GDP and MCAP/GDP, these effects are not statistically significant. The coefficient of multiple determination ($R^2$) for models of LIQ and M2/GDP; CPS/GDP; CBL/GDP; FSC/GDP and MCAP/GDP are 0.442829, 0.437059, 0.461004, 0.399742 and 0.402205 respectively. This means that M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP will explain about 44%, 44%, 46%, 40% and 40% of the variations in LIQ. The remaining variations are explained by other factors outside the models.

The DW statistics for M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP models are 2.234310, 2.265019, 2.237981, 2.171029 and 2.195406 respectively. As revealed by the

probabilities of each of the models, that is, 0.3121, 0.3166, 0.1158, 0.8724 and 0.6105 for M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP respectively, the effects of independent on the dependent variables are not statistically significant in the long-run. The probabilities of *F-Statistics* for M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP models are 0.0012, 0.0014, 0.00075, 0.00331 and 0.00313 respectively. These probabilities are all less than 0.05, the level of significance, implying that all models are reliable in their entirety.

Table 1 Philip Perron Unit Root Test with intercept results

| Variable | Critical values | t-Statistic | Probability | Stationarity Level |
|---|---|---|---|---|
| **LIQ** | -3.632900* -2.948404** -2.612874*** | -6.782400 | 0.0000 | I(I) |
| **M2/GDP** | -3.632900* -2.948404** -2.612874*** | -5.377822 | 0.0001 | I(I) |
| **CPS/GDP** | -3.632900* -2.948404** -2.612874*** | -4.953423 | 0.0003 | I(I) |
| **CBL/GDP** | -3.632900* -2.948404** -2.612874*** | -3.712802 | 0.0082 | I(I) |
| **FSC/GDP** | -3.632900* -2.948404** -2.612874*** | -4.196810 | 0.0023 | I(I) |
| **MCAP/GDP** | -3.632900* -2.948404** -2.612874*** | -8.867137 | 0.0000 | I(I) |

*, ** and *** denote at 1%, 5% and 10% significance level respectively
Source: Authors' computation with EViews 8 (2021)

Table 2 Short run regression results for dependent and independent variables

| Short-run regression results for LIQ and M2/GDP model | | | | |
|---|---|---|---|---|
| Variable | Coefficients | Std Error | t-Statistics | Prob |
| C | -0.607698 | 0.153414 | -3.961151 | 0.0004 |
| D(LIQ(-1) | 0.304059 | 0.165670 | 1.835328 | 0.0761 |
| D(M2/GDP(-1)) | 1.638327 | 1.124635 | 1.456763 | 0.1552 |
| ECT1 (-1) | -0.913813 | 1.685109 | -0.542287 | 0.5915 |
| $R^2$ = 0.351466    Adjusted $R^2$ = 0.288705    DW = 2.29715 Prob (F-Stat) = 0.00345 | | | | |
| Short-run regression results for LIQ and CPS/GDP model | | | | |
| Variable | Coefficients | Std Error | t-Statistics | Prob |
| C | -0.604850 | 0.153330 | -3.944747 | 0.0004 |
| D(LIQ(-1) | 0.300342 | 0.166163 | 1.807512 | 0.0804 |
| D(CPS/GDP(-1)) | 1.334209 | 0.951894 | 1.401637 | 0.1710 |
| ECT2 (-1) | -0.950655 | 1.701701 | -0.558650 | 0.5804 |
| $R^2$ = 0.345495    Adjusted $R^2$ =0.282156    DW = 2.263821 Prob (F-Stat) = 0.003953 | | | | |
| Short-run regression results for LIQ and CBL/GDP model | | | | |
| Variable | Coefficients | Std Error | t-Statistics | Prob |
| C | -0.568522 | 0.146946 | -3.868923 | 0.0005 |
| D(LIQ(-1) | 0.274125 | 0.161994 | 1.692193 | 0.1006 |
| D(CBL/GDP(-1)) | 1.041786 | 0.524711 | 1.985446 | 0.0560 |

11

| | | | | |
|---|---|---|---|---|
| ECT3 (-1) | -0.908852 | 1.639714 | -0.554274 | 0.5834 |

$R^2 = 0.373010$     Adjusted $R^2 = 0.312334$     DW = 2.240785 Prob (F-Stat) = 0.002099

| Short-run regression results for LIQ and FSC/GDP model | | | | |
|---|---|---|---|---|
| Variable | Coefficients | Std Error | t-Statistics | Prob |
| C | -0.571911 | 0.167659 | -3.411164 | 0.0018 |
| D(LIQ(-1) | 0.307748 | 0.173334 | 1.775463 | 0.0856 |
| D(FSC/GDP(-1)) | 0.445722 | 2.564180 | 0.173826 | 0.8631 |
| ECT4 (-1) | -0.382192 | 1.723152 | -0.221798 | 0.8259 |

$R^2 = 0.298216$     Adjusted $R^2 = 0.220430$     DW = 2.180380 Prob (F-Stat) = 0.0013178

| Short-run regression results for LIQ and MCAP/GDP model | | | | |
|---|---|---|---|---|
| Variable | Coefficients | Std Error | t-Statistics | Prob |
| C | -0.542883 | 0.155819 | -3.484073 | 0.0015 |
| D(LIQ(-1) | 0.287965 | 0.168058 | 1.713488 | 0.0966 |
| D(MCAP/GDP(-1)) | 0.131196 | 0.341720 | 0.383928 | 0.7037 |
| ECT5 (-1) | -0.429250 | 1.710930 | -0.250887 | 0.8036 |

$R^2 = 0.302730$     Adjusted $R^2 = 0.235252$     DW = 2.214365 Prob (F-Stat) = 0.009974

Source: Authors' computation with EViews 8 (2021)

Table 3: Long-run regression model results for dependent and independent variables

| Long-run regression model results for LIQ and M2/GDP | | | | |
|---|---|---|---|---|
| Variable | Coefficient | Standard Error | t-Statistics | Prob. |
| C | 0.697536 | 0.165212 | 4.222057 | 0.0002 |
| LIQ (-1) | -0.306250 | 0.168709 | -1.815257 | 0.0795 |
| M2/GDP (-1) | 1.175365 | 1.143174 | 1.028159 | 0.3121 |
| $R^2 = 0.442829$     Adjusted $R^2 = 0.368539$     DW = 2.234310     Prob (*F-Stat*) = 0.0012 | | | | |
| Long-run regression model results for LIQ and CPS/GDP | | | | |
| Variable | Coefficient | Standard Error | t-Statistics | Prob. |
| C | 0.695795 | 0.166611 | 4.176169 | 0.0002 |
| LIQ (-1) | -0.300571 | 0.169013 | -1.778387 | 0.0855 |
| CPS/GDP (-1) | 0.979107 | 0.961259 | 1.018568 | 0.3166 |
| $R^2 = 0.437059$     Adjusted $R^2 = 0.362000$     DW = 2.265019     Prob (*F-Stat*) = 0.0014 | | | | |
| Long-run regression model results for LIQ and CBL/GDP | | | | |
| Variable | Coefficient | Standard Error | t-Statistics | Prob. |
| C | 0.703975 | 0.161587 | 4.356635 | 0.0001 |
| LIQ (-1) | -0.273330 | 0.164738 | -1.659179 | 0.1075 |
| CBL/GDP (-1) | 0.885076 | 0.546561 | 1.619355 | 0.1158 |
| $R^2 = 0.461004$     Adjusted $R^2 = 0.389137$     DW = 2.237981     Prob (*F-Stat*) = 0.00075 | | | | |
| Long-run regression model results for LIQ and FSC/GDP | | | | |
| Variable | Coefficient | Standard Error | t-Statistics | Prob. |
| C | 0.719749 | 0.174481 | 4.125082 | 0.0003 |
| LIQ (-1) | -0.281333 | 0.178149 | -1.579197 | 0.1248 |
| FSC/GDP (-1) | 0.441593 | 2.725048 | 0.162050 | 0.8724 |
| $R^2 = 0.399742$     Adjusted $R^2 = 0.319707$     DW = 2.171029     Prob (*F-Stat*) = 0.00331 | | | | |
| Long-run regression model results for LIQ and MCAP/GDP | | | | |
| Variable | Coefficient | Standard Error | t-Statistics | Prob. |
| C | 0.741908 | 0.172254 | 4.307067 | 0.0002 |
| LIQ (-1) | -0.274879 | 0.175591 | -1.565453 | 0.1280 |
| MCAP/GDP (-1) | 0.188669 | 0.366570 | 0.514689 | 0.6105 |
| $R^2 = 0.402205$     Adjusted $R^2 = 0.322498$     DW = 2.195406     Prob (*F-Stat*) = 0.00313 | | | | |

## 4.7 Residual Diagnostics

To carry out residual diagnostic tests for the long run models for each equation, the Jarque-Bera normality test, the Breusch-Godfrey test of serial correlation (L-Mtest), the Breusch-Pagan-Godfrey test of residual homoscedasticity and the Cumulative Sum Recursive Residuals (CUSUM) test of residual stability are employed. Appendix 5 shows the extracts from the results of each of these tests for each of the models. Appendix 6 shows the result of the CUSUM.

From Appendix 5, the probabilities of all the models as stated in Jarque-Bera normality tests are greater than the 5%, signifying that residual of all the models are normally distributed; hence, the null hypothesis of normally distribution cannot be rejected. The Breusch-Pagan- Godfrey test of homoscedasticity results shows that two (2) of the models have probabilities less than 5% (M2/GDP and CPS/GDP), hence are homoscedasticity while the remaining three (CBL/GDP; FSC/GDP and MCAP/GDP) have their probabilities greater than 5%, signifying that they are homoscedastic. These further confirm the mixed results earlier revealed by descriptive statistics, long-run relationship and short-run relationship. From Appendix 3, it is revealed through the CUSUM test that the models employed are stable over the time of study since they are within the critical bounds of 5% lines.

## 4.7 Causality Test

Another aim of this research is to ascertain if financial deepening variables have causal relationship with banks' liquidity. The null hypothesis guiding Granger causality test is that a dependent variable is not Granger cause by any of the independent variables [33]. Appendix 7 shows the extracts from results of the Granger causality test between liquidity and financial deepening. The decision rule in using Granger approach to test for causality between variables is to compare the probability of *F-Statistic* with the 5% significance level. If the former is greater than the latter, then the null hypothesis of no causality cannot be rejected.

From appendix 7 the probabilities of *F-Statistics* for M2/GDP, CPS/GDP, CBL/GDP, FSC/GDP and MCAP/GDP are all greater than the 5% level of significance, implying that none of these financial deepening variables have causal relationship with the liquidity of the banking system in Nigeria. In other words, financial deepening variables do not Granger cause liquidity problems for banks. Again, the finding of the test of causality is in agreement with the "not statistically significant" effects of financial deepening and liquidity of the banking system in both the short and the long-run.

## 5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 5.1 Summary of Findings

Results of long-run relationship between liquidity of the banking system and financial deepening indicators show that all the five indicators considered are positively related to banks' liquidity. The coefficients of multiple determination ($R^2$) for all the five models show that financial deepening explains at least 40% of the variations in the liquidity of the banking system for years under consideration. Also, the DW for the five models are around 2, signifying that the variables used in the study do not suffer auto-correlation problem in their absolute terms. The

probabilities of *F-Statistics* for models also show that all the models are significant and reliable. All of them are less than the 5% significance level.

In the same vein, the results of the short-run relationship estimation show that all the financial deepening variables examined have positive but statistically insignificant effects on the liquidity of the banking system. The ($R^2$) for all the five models show that financial deepening explains at least 30% of the variations in bank liquidity. The DW statistics for the five models are all close to 2, implying a lack of autocorrelation in the variables. The *F-Statistics* and its probabilities for all the models equally show that the models are statistically significant. The speeds of adjustment (error correction term) show that most of previous year's deviations from the mean are corrected in the new year, although none of the probabilities of error correction terms is statistically significant.

Furthermore, a test of causality between banks' liquidity and financial deepening shows no causality between liquidity and any of the financial deepening ratios. With the results, it is safe to state that in the short- and long-run, the effect of financial deepening indicators on bank liquidity in Nigeria is positive in agreement with the research *a priori* expectation. However, the relationship is not significant in both short and long-run periods.

The revealed positive effect of financial deepening on bank liquidity, though not significant, requires particular attention. This is because one may be tempted to believe that banks can face liquidity crises as they advance more credits into the economy. But the outcome of this research suggests the contrary as it is positive. Again, that the effect of financial deepening on banks' liquidity is not statistically significant reveals that the overall goal of maintaining a healthy balance between liquidity and loans and advances by the banking system is yet to be fully achieved.

The findings of this research summarily show that financial deepening does not cause financial crises. In fact, on the contrary, the findings show that financial deepening can spur good liquidity position of banks if managers develop efficient strategies that will ensure healthy balance between investment and liquidity. For example, variables that have positive but statistically insignificant effect on banking system liquidity position could be particularly worked and improved upon to make their contributions significant. The banking system still have a lot to reap from financial deepening.

## 5.2 Conclusion and Recommendations

The main objective set out for this study was to ascertain if financial deepening makes banks illiquid. In essence, the study attempted to ascertain the impact of financial depth indicators on the liquidity of Nigerian banks for the period 1981 to 2019. While the liquidity of the banking system was represented by the average loan/deposit ratio, the financial deepening variables were represented by the ratio of money supply ($M_2$) to the gross domestic product (GDP); private sector to GDP; ratio of commercial bank liabilities to GDP; ratio of financial sector contribution to GDP and that of stock market capitalization to GDP. The study employed Time Series estimation techniques of long-run regression estimation (vector auto-regressive – VAR) and short-run (error correction models – ECM) models to ascertain whether banking system liquidity

and financial deepening variables are related and the nature of such relationship(s). This it did by analyzing the loan-deposit ratios of Nigerian banks and five financial deepening ratios for 39 years (1981-2019).

Findings from our study reveal that financial deepening variables positively influence the liquidity of the Nigerian banking system during the years selected in the short and in the long run. However, this positive influence was found to be insignificant. Furthermore, the study disclosed that there is no causality between banking system liquidity and financial deepening variables. These findings agree with those of [29].

Based on its findings, the study concludes that, in the short and the long-run, financial deepening affects the liquidity of Nigerian banks and that the effect is positive but not statistically significant. Also, the study, based on the causality analysis, concludes that banking system liquidity and financial deepening have no causal relationship. The study, therefore, recommends that banks should re-strategize in implementing financial deepening policies that are liquidity friendly.

The positive effect of financial deepening on banks' liquidity is insignificant. This may signify that a considerable portion of the funds invested does not return to the banks in terms of returns and deposits. Policy wise, we advocate that the Central Bank of Nigeria particularly note this lacuna in designing monetary and credit policies and formulate policies that will not only focus on credit and loan beneficiaries, but also on the banks.

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# APPENDICES

## Appendix 1: DESCRIPTIVE STATISTICS

|  | LIQ | M2_GDP | CPS_GDP | CBL_GDP | FSC_GDP | MCAP_GDP |
|---|---|---|---|---|---|---|
| Mean | 67.55958 | 14.18099 | 10.88464 | 22.65730 | 3.384595 | 10.42108 |
| Median | 69.57769 | 12.65026 | 8.207608 | 20.16000 | 3.020000 | 6.850000 |
| Maximum | 85.66147 | 21.29056 | 20.77330 | 40.65000 | 7.540000 | 39.97000 |
| Minimum | 37.96500 | 9.151675 | 5.917270 | 12.14000 | 1.900000 | 3.050000 |
| Std. Dev. | 12.49743 | 3.988102 | 5.352272 | 7.580880 | 1.399551 | 8.456843 |
| Skewness | -0.690191 | 0.707337 | 0.969376 | 0.643275 | 1.299095 | 1.385763 |
| Kurtosis | 2.820893 | 1.944073 | 2.138748 | 2.447018 | 4.220810 | 5.038800 |
|  |  |  |  |  |  |  |
| Jarque-Bera | 2.987028 | 4.804268 | 6.938289 | 3.023209 | 12.70482 | 18.25035 |
| Probability | 0.224582 | 0.090525 | 0.031144 | 0.220556 | 0.001743 | 0.000109 |
|  |  |  |  |  |  |  |
| Observations | 37 | 37 | 37 | 37 | 37 | 37 |

Source: Authors' computation with EViews (2021)

## Appendix 2: Correlation Matrix

|  | LIQ | M2_GDP | CPS_GDP | CBL_GDP | FSC_GDP | MCAP_GDP |
|---|---|---|---|---|---|---|
| LIQ | 1 |  |  |  |  |  |
| M2_GDP | 0.679225 | 1 |  |  |  |  |
| CPS_GDP | 0.815473 | 0.653483 | 1 |  |  |  |

| | | | | | |
|---|---|---|---|---|---|
| CBL_GDP | 0.893276 | 0.878842 | 0.786543 | 1 | |
| FSC_GDP | 0.909419 | 0.901470 | 0.792086 | 0.964988 | 1 | |
| MCAP_GDP | 0.456732 | 0.503840 | 0. 676661 | 0.2485654 | 0.674321 | 1 |

Source: Authors' computation with EViews (2021)

Appendix 3: Results of Trace Test of cointegration of LIQ with financial deepening variables.

| Null Hypothesis | Alternative Hypothesis | Statistics | Critical Values | *p*-values |
|---|---|---|---|---|
| **Cointegration test between LIQ and M2/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 18.76605 | 15.49471 | 0.0155 |
| $r \leq 1$ | $r \geq 2$ | 0.883601 | 3.841466 | 0.3472 |
| **Cointegration test between LIQ and CPS/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 17.94560 | 15.49471 | 0.0209 |
| $r \leq 1$ | $r \geq 2$ | 0.044682 | 3.841466 | 0.8326 |
| **Cointegration test between LIQ and CBL/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 19.21956 | 15.49471 | 0.0131 |
| $r \leq 1$ | $r \geq 2$ | 2.245434 | 3.841466 | 0.1340 |
| **Cointegration test between LIQ and FSC/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 21.55010 | 15.49471 | 0.0054 |
| $r \leq 1$ | $r \geq 2$ | 4.459918 | 3.841466 | 0.0347 |
| **Cointegration test between LIQ and MCAP/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 21.64440 | 15.49471 | 0.0052 |
| $r \leq 1$ | $r \geq 2$ | 1.238872 | 3.841466 | 0.2657 |

Source: Authors' computation with EViews 8 (2021)

Appendix 4: Results of Maximum-Eigen Test of cointegration of LIQ with financial deepening variables.

| Null Hypothesis | Alternative Hypothesis | Statistics | Critical Values | *p*-values |
|---|---|---|---|---|
| **Cointegration test between LIQ and M2/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 17.88245 | 14.26460 | 0.0128 |
| $r \leq 1$ | $r \geq 2$ | 0.883601 | 3.841466 | 0.3472 |
| **Cointegration test between LIQ and CPS/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 17.90092 | 14.26460 | 0.0127 |
| $r \leq 1$ | $r \geq 2$ | 0.044682 | 3.841466 | 0.8326 |
| **Cointegration test between LIQ and CBL/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 16.97413 | 14.26460 | 0.0182 |
| $r \leq 1$ | $r \geq 2$ | 2.245434 | 3.841466 | 0.1340 |
| **Cointegration test between LIQ and FSC/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 17.09019 | 14.26460 | 0.0174 |
| $r \leq 1$ | $r \geq 2$ | 4.459918 | 3.841466 | 0.0347 |
| **Cointegration test between LIQ and MCAP/GDP** | | | | |
| $r = 0$ | $r \geq 1$ | 20.40553 | 14.26460 | 0.0047 |
| $r \leq 1$ | $r \geq 2$ | 1.238872 | 3.841466 | 0.2657 |

Source: Authors' computation with EViews 8 (2021)

Appendix 5: EXTRACTS OF RESIDUAL DIAGNOSTICS TEST RESULTS

**Jarque-Bera Normality Test**

| LIQ and M2/GPD model | Prob: 0.407989 |
|---|---|
| LIQ and CPS/GDP model | Prob: 0.394901 |
| LIQ and CBL/GDP model | Prob: 0.316473 |
| LIQ and FSC/GDP model | Prob: 0.221674 |
| LIQ and MCAP/GDP model | Prob: 0.269548 |
| **Breusch-Pagan-Godfrey test of Heteroskedacity** | |
| LIQ and M2/GPD model | Prob. Chi- square: 0.0168 |
| LIQ and CPS/GDP model | Prob. Chi- square: 0.0081 |
| LIQ and CBL/GDP model | Prob. Chi- square: 0.0634 |
| LIQ and FSC/GDP model | Prob. Chi- square: 0.9139 |
| LIQ and MCAP/GDP model | Prob. Chi- square: 0.2300 |

Source: Authors' computation using E-Views 8 (2021)

Appendix 6: CUSUM TEST OF RESIDUALS
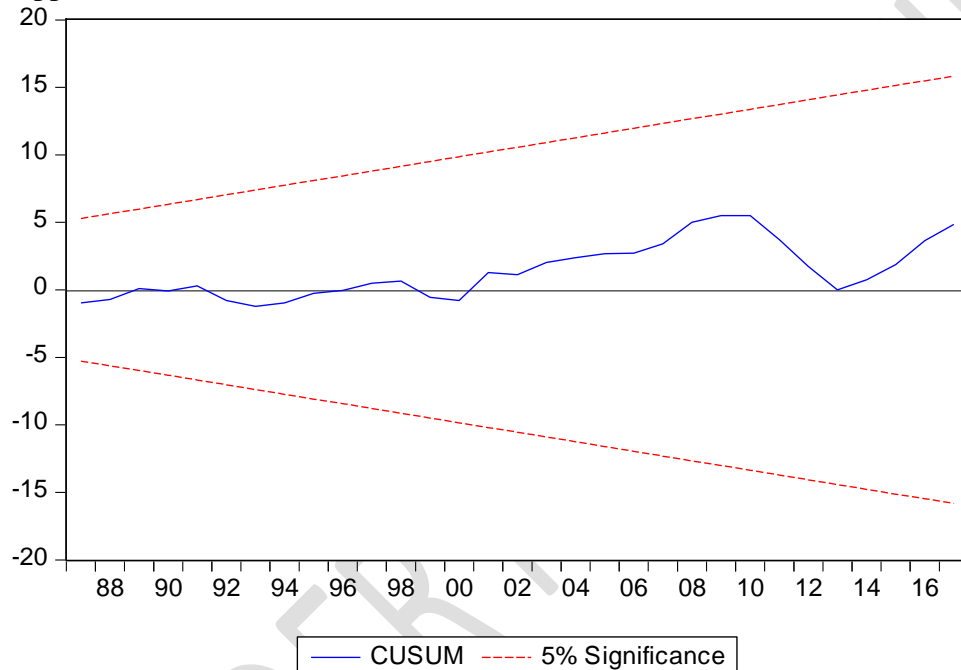


Source: Authors' design with E-Views (2021)

Appendix 7: CAUSALITY TEST

| Pairwise Granger Causality Tests | | | |
|---|---|---|---|
| Sample: 1981 2019 | | | |
| Lags: 2 | | | |
| Null Hypothesis: | Obs | F-Statistic | Prob. |
| M2_GDP does not Granger Cause LIQ | 39 | 1.26773 | 0.2961 |
| LIQ does not Granger Cause M2_GDP | | 0.94428 | 0.4002 |
| | | | |
| CPS_GDP does not Granger Cause LIQ | 39 | 1.10100 | 0.3456 |
| LIQ does not Granger Cause CPS_GDP | | 0.21407 | 0.8085 |
| | | | |

| | | | |
|---|---|---|---|
| CBL_GDP does not Granger Cause LIQ | 39 | 1.81628 | 0.1801 |
| LIQ does not Granger Cause CBL_GDP | | 0.87824 | 0.4259 |
| | | | |
| FSC_GDP does not Granger Cause LIQ | 39 | 0.10002 | 0.9051 |
| LIQ does not Granger Cause FSC_GDP | | 0.92575 | 0.4073 |
| | | | |
| MCAP_GDP does not Granger Cause LIQ | 39 | 0.16226 | 0.8510 |
| LIQ does not Granger Cause MCAP_GDP | | 0.78339 | 0.4660 |

Source: Authors' computation with EViews 8 (2021)