Research Article

# Conundrums of the Liquidity Determinants of Commercial Banks in Ethiopia

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**This study examines the conundrums of the liquidity determinants of commercial banks in Ethiopia. The study employed a causal research design by utilizing data from 2011 to 2021. The unit of analysis is 15 commercial banks in Ethiopia. It utilized the General Methods of Moments (GMM) dynamic panel regression. The findings showed that bank profit, interest rate margin, concentration ratio, and inflation have significantly adverse effects on bank liquidity. However, capital adequacy has no significant effect on the bank's liquidity. Besides, the growth of the gross domestic product and exchange rate significantly enhance the bank's liquidity. The study urges bank management and regulatory bodies to search for the optimum trade-off point between profit and interest rate spread at the required level of liquidity. Besides, policymakers and regulators should take measures that neutralize the detrimental effect of the market structure of the banking industry. Since inflation and money supply (M2) negatively affect liquidity, it is vital to transform macroeconomic variables into a robust institutional mechanism to enhance liquidity. Generally, the study recommends continued supervision and support to shield banks from a liquidity crunch.**

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## 1. Introduction

An essential component of any country's financial system is its commercial banks. They always try to enhance their working environments, banking instruments, and operations to keep up with the world's rapid development since they provide a crucial and effective financial bridge between surplus and deficit destinations[1]. According to Prefontaine[2], liquidity is a bank's strength to set a reasonable level of liquidity to satisfy necessary emergencies.

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Commercial banks aim to maximize their earnings and owners' wealth, but preserving appropriate liquidity is equally crucial due to its effects on banks' operations, financial performance, and the economy[3]. After the global financial crisis, it became clear that banks' liquidity positions were a big problem. As a result, several large commercial banks with serious liquidity problems went insolvent.

Banks' primary traditional activity is converting deposits (liquid liabilities) into loans (non-liquid assets), which results in a maturity gap since various assets have varying maturities and impact the bank's liquidity position. Therefore, banks typically keep liquid assets to close this maturity mismatch[4]. A bank may lose its solvency, harm its reputation, and cause a systemic collapse if it lacks the capital necessary to meet market demand. There have been new improvements in quantity and quality since the Ethiopian banking sector began restructuring commercial banks, and liquidity problems are a significant worry in the current economic climate. For instance, banks continued to experience a severe liquidity crunch despite the National Bank of Ethiopia (NBE) providing them with 15 billion birr in liquidity in 2019, so they could help their customers needing extra loans and debt relief.

Previous studies have extensively covered the liquidity determinants of banks; however, they have been unable to reach any definite findings in any case[5][6][7][8][9]. Furthermore, many studies overlooked the market concentration ratio, which helps examine market power (industry-specific factors) and understand its influence on bank liquidity. Additionally, the researcher found that earlier research had neglected crucial macroeconomic variables, such as broad money (M2) and exchange rates, which are necessary for understanding how changes in the amount of money in circulation and the currency's value affect commercial banks' liquidity positions. Consequently, the study attempted to bridge this knowledge vacuum in the existing literature. The work builds on existing knowledge, contributing theoretically to the subject as well. Lastly, the study's conclusions provide useful ramifications and suggestions for bank management, government agencies, regulatory organizations (NBE), and decision-makers.

The following is a list of the paper's remaining sections. The literature is presented in Part 2, the methodologies and conceptual framework are presented in Part 3, the results are shown in Part 4, and the findings are discussed in Part 5. The conclusion, suggestions, and venues for future research are covered in the last section.

## 2. Literature Review

Among the theories of liquidity in the literature that discuss shiftability, market liquidity, and commercial loans are prominent.

## 2.1. Liquidity Theories

### 2.1.1. Shiftability Theory

Despite the fact that bank loans constituted a vital source of liquidity, Moulton[10] popularized this notion as an alternative to the self-liquidating paper theory. The idea is that if a bank's assets may be moved to other banks before the due date, in case it becomes necessary, then the bank's liquidity will be preserved. The theory advises banks on possible methods for meeting liquidity requirements and contends that banks can preserve assets quickly sold for cash to avoid a liquidity crunch[11][12]. When liquidity is tight, it shifts assets to a bank with remarkably high liquidity[13]. Instead of relying on the backing of central banks to deal with unforeseen crises, commercial banks can manage convertible assets in advance to avert losses caused by emergency events[12].

According to Bhattacharya, an institution can maintain liquidity by holding assets that can be easily moved, transferred, or sold for cash with minimal transaction costs or value loss. To obtain the maximum level of shiftability, Gomez[14] urges the Central Bank, which acts as the lender of last resort, to be able to buy the assets. As per the principle, the bank should acquire assets that are marketable, transferable, and shiftable so that they can guarantee the bank some liquidity when needed.

### 2.1.2. Commercial Loan Theory

The earliest theory of a bank's core business operations is the commercial loans theory, commonly called the "real bills doctrine theory." The bank's short-term loans, which are used to support the transfer of saleable items from the producer to the consumer, are the most liquid loans it can make, according to Matz[15]. Since the funded items were promptly sold and the obligation was settled, the loans are seen as self-liquidating. Shekhar[16] propagated the idea that short-term loans and self-liquidating commercial papers are intended to provide current operational funds. According to this theory, a bank should only supply its customers with commercial documents and short-term, self-liquidating loans[17].

### 2.1.3. Bank Liquidity Creation and Financial Fragility Theory

Banks can be considered liquidity pools by investing in illiquid loans and funding them with demandable deposits[18][4][19]. Additionally, banks with greater liquidity could buy out or merge with weaker competitors to increase their market share. Petersen and Rajan[20] contend that increased competition inhibits the development of liquidity, which validates the relationship between market power and bank liquidity. Thus, it

lends credence to the financial fragility channel theory. Banks attempt to limit the number of deposits they accept and the number of loans they make in order to minimize potential hazards and prevent the possibility of bankruptcy[21][22]. Limited liquidity generation is encouraged because of pressures on risk management and credit allocation[23][24].

### *2.2. Bank Liquidity*

Contemporary financial theories have recognized that banks exist because they perform two crucial economic tasks: generating liquidity and managing risks[25]. In particular, banks function as a middleman between liquid liabilities (deposits) and illiquid assets, i.e., loans[26]. The liquidity gap and ratio analysis are the two main techniques for assessing liquidity risk. The disparity between liabilities and assets at current and future dates is known as the liquidity gap[5]. Different balance sheet ratios, known as liquidity ratios, should highlight underlying shifts in liquidity[5]. The ratios of liquid assets to total assets, liquid assets to deposits and short-term borrowing, loans to total assets, and loans to deposits and short-term borrowing are among the liquidity ratios that most scholars agree upon[5].

### *2.3. Determinants of Liquidity and Hypotheses*

The determinants of liquidity can broadly be classified into bank-specific, industry-specific, and macroeconomic variables.

### *2.4. Bank-Specific Factors*

Bank-specific factors include those that fall under the supervision of bank management bodies.

#### *2.4.1. Bank Profit*

Along with other factors, banks' profitability is closely linked to liquidity. Studies have used many metrics to gauge bank performance, i.e., return on assets (ROA), net interest margin (NIM), and return on equity (ROE) (e.g., [27][28][6][29]). ROA is the most crucial indicator because it shows the returns generated from its assets[30]. According to specific studies (e.g., [6][31][28][29]), ROA has a favorable impact on banks' liquidity. Ferrouhi[27], however, found that ROA negatively impacts bank liquidity. Furthermore, Yitayaw[9] discovered that ROA has no effect on bank liquidity.

Due to the inherent conflicts between the two, banks must be both profitable (to satisfy shareholders' demands) and liquid (to meet legal requirements)—a balance must be struck. Consequently, the research proposes the subsequent hypothesis:

- **Hypothesis 1:** Bank profit has a statistically significant negative effect on bank liquidity.

### *2.4.2. Bank Size*

Dietrich and Wanzenried[32] claim that a bank's total assets or deposits can be used to estimate its size. Similar to economies of scale, the larger they become, the more they can overcome the risk. Banks that believe they are "too large to fail" may engage in risky activity and expose themselves to too much danger. The findings of empirical studies on the relationship between bank size and liquidity are conflicting. According to studies, the size of the bank negatively affects the bank's liquidity[5][6][9].

Some studies, such as those by Melese & Laximikantham[28], Ferrouhi[27], and Shaha et al.[33], indicate that larger banks have greater liquidity than smaller banks. Furthermore, Assfaw[7] found a negligible impact on bank liquidity. The study proposed the following hypothesis in light of the aforementioned arguments:

- **Hypothesis 2:** Bank size has a statistically significant negative effect on bank liquidity.

### *2.4.3. Capital Adequacy*

As propagated by the financial fragility theory, liquidity is favored by lower capital levels, while creating liquidity is reduced by more significant capital levels[34]. According to Goddard, Molyneux, and Wilson's[35] argument, a higher capital ratio may also inhibit liquidity production by crowding out deposits. The liquidity of banks is adversely impacted by capital adequacy, according to several studies[36][37][7]. However, other research found a statistically significant positive relationship between capital adequacy and bank liquidity, meaning that higher bank capital adequacy correlates with increased bank liquidity[6][5][38]. Therefore, the study put forth the hypothesis:

- **Hypothesis 3:** Capital adequacy has a statistically significant negative effect on bank liquidity.

### *2.4.4. Deposit Mobilization*

Deposits are the primary source of funding for banks' lending[39]. If the lending channel is active, the growth in deposits should increase the number of loans available since banks will have an additional source of funding[40]. The research literature does, however, disclose conflicting findings about the relationship between deposits and bank liquidity. Several studies say deposits harm liquidity[33][7]. According to other studies, deposits have a strong positive impact on bank liquidity, which boosts holdings of liquid assets[6][41][29][9].

- **Hypothesis 4**: Bank deposits have a statistically significant positive effect on liquidity.

### *2.5. Industry-Specific Factor*

According to the Structure-Conduct Performance and Relative Market Power theories, market power has a significant impact on bank lending and risk-taking practices[42]. Significant competition, or low market power, has been demonstrated to impact bank pricing strategies, leading to a decline in lending rates and a rise in deposit rates between commercial banks[43]. Berger and Hannan[44] claimed that banks with monopoly strength were driven to impose prices, which decreased liquidity in a market with little rivalry. Similarly, Courvoisier and Gropp[45] validated that lower interest rates on demand deposits resulted in less liquidity for banks operating in a much more concentrated market.

Stronger banks can raise the liquidity of the financial market, or weaker institutions can raise their demand for liquidity[46][47][21][48]. Therefore, in order to investigate whether bank market power limits bank liquidity, the study put forth this hypothesis.

- **Hypothesis 5.** Market concentration has a statistically significant negative effect on liquidity.

### *2.6. Macroeconomic Variables*

The management of banks cannot influence macroeconomic factors that affect how well they operate and perform. The study presents macroeconomic factors that affect liquidity as follows.

#### *2.6.1. Interest Rate Margin*

The difference between such two rates is known as the interest rate margin because banks use deposits they get in exchange for paying a particular interest rate to make loans at a greater rate.[49]. Because increased intermediation will reduce banks′ liquidity, banks must decide between maximizing the interest on investments in the form of loans and their requirement for liquidity[25]. It implies that a rise in the interest margin encourages banks to concentrate more on lending operations, which lowers the proportion of liquid assets. When the IRM size rises, lenders forfeit their liquid assets[8][29]. Conversely, the liquidity rate rises in response to an increase in the IRM[7][41][9]. The study bases its hypothesis on the theoretical and empirical justifications mentioned above.

- **Hypothesis 6:** IRM has a statistically significant negative effect on liquidity.

### *2.6.2. Inflation Rate*

When demand for goods and services exceeds supply in the economy, inflation results; additionally, higher inflation rates result in decreased liquidity and worsen macroeconomic conditions. The outcomes of empirical investigations are mixed, nevertheless. According to several studies, inflation improves bank liquidity[50][6][5]. Additionally, it was discovered by Al-Homaidi et al.[29] and Assefaw[7] that inflation had no appreciable impact. On the other hand, several studies discovered a detrimental impact of inflation on bank liquidity[5][27][51][29]. Living expenses will rise during an inflationary period, deposits will likely decrease, and as a result, liquidity will suffer. Thus, the study claimed this hypothesis.

- **Hypothesis 7:** Inflation has a statistically significant negative effect on liquidity.

### *2.6.3. Exchange Rate*

The cost or price of a good or service can be expressed in a common currency using exchange rates, which are calculated as foreign currency per unit of local currency. Deposits will decrease if currencies fall because investors prefer to withdraw their money and convert it to a hard currency that appreciates or invest in other investments rather than bank deposits. Exchange rate fluctuations may directly impact the trade balance, price stability, and financial stability. Al-Homaidi et al.[29] showed that the exchange rate positively impacts liquidity; however, Bhati, De Zoysa, & Jitaree[52] found that the impact is negligible. The study put forward the following hypothesis.

- **Hypothesis 8:** Exchange rate has a statistically significant positive effect on liquidity.

### *2.6.4. Real Gross Domestic Product*

The gross domestic product (GDP) gauges the soundness of a country's finances. The concept of bank liquidity and financial fragility holds that banks will profit by increasing loanable funds to support an economic boom while reducing loanable funds during an economic downturn to prioritize liquidity. However, there are times when banks want more liquidity because they need to feel more certain about generating money in a downturn. According to certain studies, increasing the GDP enhances banks' liquidity[51][53][41]. However, other research showed the opposite[5][27][53][6][7][9]. Consequently, the study claimed the next hypothesis.

- **Hypothesis 9:** GDP has a statistically significant positive effect on bank liquidity.

### *2.6.5. Money Supply*

The money supply is the national economy's available payment instruments[54]. The Broad Money (M2) aggregation of the money supply aims to include a wider variety of liquid assets, including specific interest-earning components like savings and term deposits[55]. M2 is the strongest indicator of Ethiopia's money supply because it captures all forms of currency and both short- and long-term deposits, according to NBE. The expansion of M2 shows increased money circulation in the economy. Loanable funds become more affordable with a growth in the money supply, which lowers borrowing costs for businesses and consumers; consumption rises, which could cause savings to decline. M2 thereby reduces bank liquidity. Thus, the study anticipated the subsequent hypothesis.

- **Hypothesis 10:** M2 has a statistically significant negative effect on liquidity.

## 3. Methods

Cross-sectional and time-series data are combined to create panel data. A balanced panel of data has the same number of time periods for each individual; an imbalanced panel of data has different time units for each individual[56][57]. Static panel data analysis and dynamic panel data analysis are the two primary approaches used in the panel data regression model. Three approach models are utilized in static panel data analysis: the Random Effects Model (REM), the Fixed Effects Model (FEM), and the Common Effects Model[56][57].

Arellano and Bond[58] and Arellano and Bover[59] presented the generalized method of moments (GMM) for models based on dynamic panel data. This method uses instrumental variables to compute the parallel-moment conditions. The system GMM model additionally combines the results of multiple estimation methodologies, including maximum likelihood, two-stage least squares, and ordinary least squares (OLS). Compared to the "difference" GMM, the "system" GMM employs a greater number of easily accessible instruments and provides greater efficiency gains[59][60]. Besides, internal instruments could address any endogeneity problems brought into the models by the explanatory variables[61]. By taking year-fixed effects into account, the estimating approach accounts for unobserved heterogeneity.

Using the specification tests offered by Arellano and Bover[59], the validity of the instruments employed in the GMM estimates is evaluated. First, the Arellano Bond serial correlation test is adjusted to examine the first-differenced residuals for second-order serial correlation. Second, when the instrumental factors are strictly exogenous, the residuals are used to regress the variables, which helps the Sargan test detect

endogeneity. Standard recommendations state that in order to accept the null hypothesis of valid instrumental variables, the p-value of the Sargan test must be more than 0.1[62].

### *3.1. Data and Sample Size*

Scholars are increasingly using secondary data to conduct empirical investigations into real-world occurrences. The study employed 15 commercial banks in Ethiopia from 2011 to 2021. Consequently, the study employed a sample size of 165 observations. Besides, secondary data were gathered from the commercial banks' and NBE's annual reports.

### *3.2. Model Specifications*

Because two-step GMM estimators account for heteroscedasticity and yield consistent estimates in the presence of a lagged dependent variable, Blundell and Bond[63][61] recommend using them. More instruments are required for the first difference equation pertaining to the lagged explanatory variable levels. Additionally, the first differences in the GMM estimate are affected by the loss of significant observations. In these conditions (bias and imprecision), it is expected that first-difference GMM estimation will perform poorly and require improved finite sample characteristics. Arellano and Bover[59] suggested a system GMM estimator as an alternative. The system GMM estimator combines a set of level equations with the typical set of starting difference equations. With this approach, the lag-dependent variable is added while acting as an independent variable. Therefore, the GMM model equation is formulated:

$$yit = \delta y_{i,t-1} + \beta x_{i,t} + \mu_{it} \tag{1}$$

Where: $y$ $i$, $t$: The dependent variable, which is the i$^{th}$ observation of the cross-section unit for the time t. $\delta$: The intercept, which is the group/individual effect of the i$^{th}$ unit cross-section for time t. β: constant vector of size $K$ × 1, where K is the number of independent variables $x_{it}$. The system GMM model of the current study was stated in equations 2, 3, and 4:

$$LIQ_{1,2it} = f(B_{it}, I_{it}, M_{it}, \mu_{it}) \tag{2}$$

$LIQ_{1,2}$ (i.e., L1 and L2) are the two liquidity ratios used in the study. B, I, and M denote bank, industry, and macroeconomic determinants of liquidity for the cross-section "i" in time "t," and $\mu_{it}$ is the error term, respectively. Therefore, the system GMM models of macroeconomic stability for all four measures of fiscal decentralization are given in equations 2 and 3 as follows:

$$\begin{aligned} L1_{it} = \beta_0 + \delta(L1_{it-1}) + \beta_1(\text{ ROA }_{it}) + \beta_2(\text{ Deposit }_{it}) + \beta_3(\text{ CA }_{it}) + \beta_4(\text{ Size }_{it}) + \beta_5(\text{ Concentration }_{it}) \\ + \beta_6(\text{ IRM }_{it}) + \beta_7(\text{ GDP }_{it}) + \beta_8(\text{ Exchange }_{it})\,\beta_9(\text{ Inflation }_{it}) + \beta_{10}(M_{it}) + \mu_{it} \end{aligned} \tag{3}$$

$$L2_{it} = \beta_0 + \delta\left(L2_{it-1}\right) + \beta_1\left(ROA_{it}\right) + \beta_2\left(\text{ Deposit }_{it}\right) + \beta_3\left(CA_{it}\right) + \beta_4\left(\text{ Size }_{it}\right) + \beta_5\left(\text{ Concentration }_{it}\right) + \beta_6\left(\text{ IRM }_{it}\right) + \beta_7\left(GDP_{it}\right) + \beta_8\left(\text{ Exchange }_{it}\right)\beta_9\left(\text{ Inflation }_{it}\right) + \beta_{10}\left(M2_{it}\right) + \mu_{it} \qquad (4)$$

### *3.3. Variables*

The study utilized numerous vital variables while specifying the empirical model.

#### *3.3.1. Dependent variable*

The current study employed the liquid assets to total assets ratio (L1) and the liquid assets to deposits ratio (L2) to gauge the liquidity of banks. The most widely used indicator of liquidity risk, the L1, tells how well a bank can generally withstand a liquidity shock. The L2 is a somewhat stringent measure of liquidity. However, it allows us to capture at least a portion of the market liquidity risk because it implies banks are unable to borrow from other banks in the event of a liquidity requirement[5]. According to the general theory, a rise in the ratio values of the dependent variables denotes a rise in liquidity capacity.

#### *3.2.2. Independent Variables*

Based on their theoretical relationship to the dependent variable, exogenous (independent) variables were chosen for the investigation. The research idea states that bank-specific variables that affect bank liquidity in Ethiopia include ROA, deposit, CA, bank size, CA, and interest rate margin. The study used the market concentration ratio as industry-specific variables, GDP growth, exchange rate, inflation rate, and broad money (M2) as macroeconomic variables.

| Variable | Measures | Symbol | Computation | Expected Sign |
|---|---|---|---|---|
| **Dependent Variable** | | | | |
| **Bank Liquidity** | Liquid Assets to Total Asset Ratio | L1 | Total Liquid Asset/Total Asset | |
| | Liquid Asset to Deposit Ratio | L2 | Total Liquid Asset/Deposit | |
| **Independent Variable** | | | | |
| **Bank-Specific Factors** | Return on Asset | ROA | Net Income Before Tax/Total Assets | - |
| | Deposit Mobilization | DEPO | Total Liquid Asset/Total Asset | + |
| | Capital Adequacy | CA | Total Capital/Total Asset | - |
| | Bank Size | Size | Natural logarithm of Total Assets | - |
| | Market Concentration | Concentration | It is the ratio of the three largest banks' assets to the total assets of the entire banking sector. | - |
| **Macroeconomics Variables** | Interest Rate Margin (spread) | IRM | [Interest income from loan and advances/Total loans and advances] — [Interest paid out on deposit /Total deposits] | - |
| | Real Gross Domestic Product (GDP) growth rate | | The annual real Growth rate of gross domestic product | + |
| | Exchange rate | Ex. Rate | Annual average exchange rate | + |
| | Inflation Rate | Inflation | Inflation Rate (%) | - |
| | Broad Money | M2 | M2=M1+Savings deposits + Time deposit | - |

**Table 1.** The Study Variables

*Source: Developed by Researcher (2023)*


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# 4. Study Results

## *4.1. Study Descriptive Statistics*

As showed in Table 2, the dependent variable L1 has a Mean= 0.96 and Std. Dev= 0.056, and L2 has a Mean= 1.399 and Std. Dev= 1.638. Besides, regarding explanatory variables, ROA (Mean= 0.1626; Std. Dev= 0.271), Deposit (Mean= 0.349; Std. Dev= 0.246), CA (Mean= 0.279; Std. Dev= 0.431), Bank size (Mean= 4.091; Std. Dev= 0.712), Int Spread (Mean= 0.871; Std. Dev= 0.033), Concentration (Mean= 1.785; Std. Dev= 0.l07), GDP (Mean= 0.235; Std. Dev= 0.321), Exchange rate (Mean= 10.818; Std. Dev= 7.383), Inflation (Mean= 1.148; Std. Dev= 2.228), and M2 (Mean= 5.657; Std. Dev= 0.303). Furthermore, the variables in the study have a normal distribution and are free from multicollinearity (as presented in Table A1 and Table A2 in the appendix).

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **L1** | 165 | .96 | .056 | .671 | .998 |
| **L2** | 165 | 1.399 | 1.638 | .047 | 17.949 |
| **ROA** | 165 | .162 | .271 | 0 | 1.948 |
| **Deposit** | 165 | .349 | .246 | -.033 | 1.957 |
| **CA** | 165 | .279 | .431 | .038 | 2.524 |
| **Bank size** | 165 | 4.091 | .712 | 2.062 | 5.99 |
| **Concentration** | 165 | 1.785 | .107 | 1.679 | 1.926 |
| **IRM** | 165 | .871 | .033 | .838 | .929 |
| **GDP** | 165 | .235 | .321 | .061 | 1.094 |
| **Excite** | 165 | 10.818 | 7.383 | 4.4 | 25 |
| **Inflation** | 165 | 1.148 | .228 | .869 | 1.528 |
| **M2** | 165 | 5.657 | .303 | 5.162 | 6.13 |

**Table 2.** Descriptive Statistics

*Source: Panel Data (2011—2021)*


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### *4.2. Determinants of Liquidity and L1*

Table 3 presents statistical tests of the GMM estimate, namely the results of autoregression (AR) tests for serial correlation and the Sargan test for over-identification. Therefore, based on the results, the estimators are robust.

| **L1** | **Coef.** | **St.Err.** | **t value** | **p-value** |
|---|---|---|---|---|
| Lag of L1 | .094 | .041 | 2.30** | .021 |
| ROA | -1.135 | .254 | -4.47*** | .000 |
| Deposit | .012 | .068 | 0.18 | .861 |
| CA | -1.505 | 1.309 | -1.15 | .25 |
| Size | .861 | .573 | 1.50 | .133 |
| Concentration | -.07 | .009 | -8.11*** | .000 |
| IRM | -20.608 | 3.525 | -5.85*** | .000 |
| GDP | 1.315 | .169 | 7.76*** | .000 |
| Ex rate | .063 | .01 | 6.07*** | .000 |
| Inflation | -.077 | .018 | -4.16*** | .000 |
| M2 | -3.593 | .726 | -4.95*** | .000 |
| Constant | 39.886 | 4.903 | 8.14 | |
| Number of observations | | 147 | | |
| GMM autocorrelation test | | AR (2) test | Z= -2.43 | .015 |
| | | AR (2) test | z= -0.26 | .793 |
| Sargan Test of Overid. Restrictions | | Wald chi2 (17) | 1.47 | .999 |
| Model test | | Wald chi2(11) | 23414.76*** | .000 |

**Table 3.** Two-step System GMM Estimation of L1

*Source: Panel Data (2011—2021)*

****p < 0.01, ** p < 0.05, * p < 0.1 indicates statistically significant at 1%, 5%, and 10% levels respectively.*

Table 3 shows that the exchange rate (P = 0.000; β = 0.063), GDP (P = 0.000; β = 1.315), and lag of L1 (P = 0.021; β = 0.094) all statistically significantly positively affect bank liquidity (L1), suggesting that the liquidity of banks is increased by a rise in these variables. The effects of IRM (P = 0.000; β = -20.608), concentration (P = -0.012; β = -0.07), inflation (P = 0.000; β = -0.077), M2 (P = 0.000; β = -3.593), ROA (P = 0.000; β = -1.135), and concentration have a statistically significant negative impact on bank liquidity. It suggests that when these variables rise, bank liquidity falls. On the other hand, bank size, CA, and deposits have no statistically significant effect on bank liquidity.

### *4.2. Determinants of Liquidity and L2*

The AR (2) test revealed that there was no second-order autocorrelation, as Table 4 illustrates. The Chi-square test indicated that the model is adequate, and the over-identification of the Sargan test demonstrated the validity of the instruments.

| L2 | Coef. | St.Err. | t value | p-value |
|---|---|---|---|---|
| Lag of L2 | -.411 | .161 | -2.55 | .011** |
| ROA | -1.05 | .43 | -2.44 | .015** |
| Deposit | -.132 | .042 | -3.18 | .001*** |
| CA | -2.732 | 1.722 | -1.59 | .113 |
| Size | -2.75 | 1.65 | -1.67 | .096* |
| Concentration | -.062 | .025 | -2.47 | .013** |
| IRM | -16.847 | 7.117 | -2.37 | .018** |
| GDP | .96 | .345 | 2.78 | .005*** |
| Ex rate | .044 | .017 | 2.64 | .008*** |
| Inflation | -3.146 | 1.653 | -1.90 | .057* |
| M2 | 1.709 | 2.101 | 0.81 | .416 |
| Constant | 24.331 | 8.139 | 2.99 | .003 |
| Number of observations | 147 | | | |
| GMM Autocorrelation Tests | AR (2) test | z= -1.76 | .078* | |
| | AR (2) test | z= -0.84 | .399 | |
| Sargan Test of Overid. Restrictions | Wald chi2 (17) | 1.22 | .999 | |
| Model Test | Wald chi2(11) | 9557.89*** | .000 | |

**Table 4.** Two-step System GMM Estimation of L2

*Source: Panel Data (2011—2021)*

****p < 0.01, ** p < 0.05, * p < 0.1 infers the level of statistically significant at 1%, 5%, and 10%, respectively.*

Table 4 indicates that there is a significant positive effect on liquidity (L2) from the lag of L2 (P = 0.011; β = 0.792), deposit (P = 0.000; β = 0.013), GDP (P = 0.005; β = 0.96), and exchange rate (P = 0.005; β = 0.044). It suggests that a rise in these factors increases bank liquidity. However, there is a statistically significant


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negative impact on bank liquidity from the lag of L2 (P = 0.011; β = 0.792), deposit (P = 0.001; β = -0.132), bank size (P = 0.096; β = -0.275), concentration (P = 0.013; β = -0.062), IRM (P = 0.018; β = -16.847), and inflation (P = 0.057; β = -3.146). It means that banks' liquidity is reduced when these variables increase. Nevertheless, there is no statistically significant difference between CA and M2 and the bank's liquidity.

## 5. Discussion

When considering lag-dependent variables, lag-L1 has a statistically significant positive influence on L1. It suggests that the current year's L1 status is improved by each year that the lag-L1 liquidity position is behind. In contrast, there is a statistically significant negative effect of lag-L2 on L2, indicating that the liquidity state of the previous year (lag-L2) influences the liquidity condition of the current year (L2).

The research indicates that, with respect to bank-specific factors, ROA has a statistically significant negative impact on banks' liquidity. This suggests that an increase in profit encourages banks to extend more credit, which could further reduce banks' liquidity. According to Ferrouhi[27], the study's findings support the notion that ROA has a negative impact on banks' liquidity. Study after study (e.g., [6][31][28][29]) has demonstrated that ROA has a positive impact on bank liquidity, contradicting this finding. Despite having a negligible impact on L1, the deposit had a substantial detrimental impact on L2. Hence, this result confirms research[33] that revealed a detrimental impact of deposits on liquidity. Nevertheless, opposed studies posited the significant positive effect of deposits on bank liquidity, indicating that deposit increases increase liquid asset holdings[6][41][29]. Besides, the study's findings revealed that CA has no statistically significant effect on bank liquidity (L1 and L2).

Despite the fact that bank size has no significant effect on L1, the findings confirmed studies that revealed a detrimental impact of bank size on L2[5][6][9], indicating that the larger the banks, the smaller the liquidity position. Nevertheless, it contradicts studies that showed a positive effect of bank size on liquidity[28][27][33]. Furthermore, the study showed a significant unfavorable contribution of IRM on liquidity (L1 and L2), indicating an increase in the interest rate spread or that IRM reduces bank liquidity. This finding corroborates studies that demonstrated the detrimental effect of IRM on banks' liquidity[8][9]. It disagrees with studies that found IRM has a statistically significant positive effect on bank liquidity[41].

Moreover, the bank concentration ratio has a statistically significant negative influence on the liquidity of banks (L1 and L2), which suggests that a rise in market power causes the banks' liquidity position to decline. Therefore, it aligns with the findings of studies by Courvoisier and Gropp[45] and Berger and Hannan[44]. Nevertheless, it contradicts studies that showed the adverse effect of concentration on liquidity[46][47][21][48].

The research indicates that GDP has a statistically significant favorable impact on liquidity (L1 and L2). This suggests that a rise in economic growth improves banks' liquidity situation. This finding supports those studies that confirmed that GDP has a positive impact on banks' liquidity[51][53][41]. However, it is inconsistent with research that has shown the adverse effect of GDP on the liquidity of banks[64][27][5][53][6]. Furthermore, the research discovered a statistically significant positive impact of the exchange rate on the liquidity of banks (L1 and L2). Thus, an increase in exchange rates, or the depreciation of the native currency, boosts bank liquidity. This finding validates studies that showed a favorable effect of the exchange rate on liquidity.

Additionally, the study proved that inflation has a significant adverse effect on bank liquidity (L1 and L2), indicating that a rise in inflation results in a decline in liquidity. This finding supports scholars who found the detrimental effect of inflation on banks' liquidity[27][51]. However, it contrasts with studies that showed a favorable effect of inflation on liquidity[50][6][5]. Finally, the study's findings showed that M2 significantly negatively affects L1, which signals an increase in M2 in the economy and pushes banks' liquidity to decline. Nevertheless, M2 exhibited a statistically insignificant effect on L2.

## 6. Conclusion

The intention of the study is to examine the variables influencing banks' liquidity in Ethiopia using panel data from 15 commercial banks between 2011 and 2021. GMM estimation was used in the study for empirical analysis. The study proved the validity of the model and instruments, as well as addressed the autocorrelation issue, using the Chi-square, Sargan, and AR test statistics, respectively. Based on an existing literature review, a hypothesis was constructed for the investigation. The study employed two measures, L1 and L2, as stand-ins for bank liquidity; the greater the ratios' values, the greater the bank's ability to withstand a liquidity shock. Besides, it employed ROA, deposit, CA, bank size, and IRM to measure bank-specific factors. The concentration ratio was used to measure the market structure of the banking industry, and macroeconomic variables (GDP, exchange rate, inflation, and M2) were used as determinants of commercial bank liquidity.

The study's findings indicated that ROA and IRM significantly adversely affect banks' liquidity (L1 and L2). Deposit and bank size significantly adversely affect L2. CA has no significant effect on L1 and L2, respectively. According to our findings, small banks are more liquid than big banks. This result completely supports the well-known "too big to fail" theory. Large banks may not be as motivated to hold liquid assets if they believe they are "too big to fail." They rely on a lender of last resort's liquidity support in case of a liquidity shortfall.

Concerning the banking industry, the concentration ratio has a significantly detrimental influence on bank liquidity (L1 and L2). Moreover, GDP and the exchange rate favorably affect liquidity (L1 and L2). Banks prefer high liquidity due to lower confidence in securing profits during an economic decline; therefore, GDP positively affects bank liquidity. Moreover, the depreciation of the domestic currency might reduce the cost of domestic goods consumption by encouraging domestic goods production and making imported goods expensive, which leads to an increase in saving due to the low cost of living. Consequently, it enhances the liquidity position of the banks. However, inflation significantly hampers banks' liquidity (L1 and L2). An increase in the inflation rate will lower the purchasing power of individuals, who will then need more money to buy the same products. As a result, the demand for loans will rise, and thus, bank liquidity will decrease. Besides, M2 significantly deters the effect on L1.

The management of large banks should stop considering themselves as "too big to fail," which may cause them to end up with excessive liquidity shock. The study urges that bank managers must choose between maximizing interest on investments in the form of loans and their need for liquidity. Besides, the bank's management and the NBE should have a tool to determine the optimum balance between profit and liquidity shock. The NBE and policymakers should look for a mechanism to reverse the market structure's deterring effect on the banking industry's liquidity positions. Also, they need an instrument to motivate and facilitate the entry of foreign banks because they might bring in innovative business techniques and boost the competitive environment in the country's banking industry. Since inflation and M2 hamper the banks' liquidity, the government should cut its total expenditure in addition to the reasonable monetary policy measures taken by the NBE.

Employing a two-step system of GMM estimation to avoid endogeneity problems, besides using two liquidity ratios (L1 and L2) and encompassing bank, industry, and macro-specific variables as much as possible, are some of its strengths. The study, however, has a flaw because it examined commercial banks from 2011 to 2021. Additionally, the study ignored vital variables such as asset quality, business diversification, industry growth, foreign direct investment (FDI), and the unemployment rate. Therefore, covering the overlooked variables might be one avenue for future research. Moreover, further study may also use other measures of liquidity, for instance, the loan-to-total-assets ratio.

# Appendix

| Variable | Obs | Pr (Skewness) | Pr (Kurtosis ) | adj_chi2(2) | Prob>chi2 |
|---|---|---|---|---|---|
| L1 | 165 | 0.000 | 0.000 | . | 0.000 |
| L2 | 165 | 0.000 | 0.000 | . | 0.000 |
| ROA3 | 165 | 0.000 | 0.000 | . | 0.000 |
| Deposit | 165 | 0.180 | 0.020 | 6.760 | 0.034 |
| CA | 165 | 0.000 | 0.000 | . | 0.000 |
| Bank size | 165 | 0.000 | 0.000 | 73.470 | 0.000 |
| IRM | 165 | 0.001 | 0.000 | 19.960 | 0.000 |
| Concentration | 165 | 0.031 | . | . | 0.000 |
| GDP | 165 | 0.000 | 0.000 | 46.180 | 0.000 |
| Exchange rate | 165 | 0.000 | 0.160 | 20.690 | 0.000 |
| Inflation | 165 | 0.020 | 0.000 | 31.910 | 0.000 |
| M2 | 165 | 0.746 | 0.000 | 53.600 | 0.000 |

**Table A1.** Skewness/Kurtosis tests for Normality

*Source: Study Panel Data (2011—2021)*


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| | Matrix of correlations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variables** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** | **(10)** | **(11)** | **(12)** |
| **(1) L1** | 1.000 | | | | | | | | | | | |
| **(2) L2** | 0.338 | 1.000 | | | | | | | | | | |
| **(3) ROA** | -0.899 | -0.554 | 1.000 | | | | | | | | | |
| **(4) Deposit** | -0.182 | -0.011 | 0.184 | 1.000 | | | | | | | | |
| **(5) CA** | -0.910 | -0.293 | 0.869 | 0.185 | 1.000 | | | | | | | |
| **(6) Bank size** | 0.446 | 0.178 | -0.550 | -0.357 | -0.527 | 1.000 | | | | | | |
| **(7) IRM** | -0.064 | 0.010 | 0.009 | 0.127 | -0.012 | 0.180 | 1.000 | | | | | |
| **(8) Concentration** | 0.080 | -0.018 | -0.055 | -0.000 | 0.010 | -0.363 | -0.458 | 1.000 | | | | |
| **(9) GDP** | -0.052 | -0.033 | 0.047 | 0.065 | 0.043 | -0.006 | 0.083 | 0.425 | 1.000 | | | |
| **(10) Exchange r** | -0.105 | -0.094 | 0.112 | 0.065 | 0.032 | 0.326 | 0.163 | -0.451 | 0.135 | 1.000 | | |
| **(11) Inflation** | -0.075 | -0.076 | 0.108 | -0.057 | 0.030 | 0.300 | -0.317 | -0.484 | -0.077 | 0.753 | 1.000 | |
| **(12) M2** | -0.125 | -0.071 | 0.131 | -0.083 | 0.015 | 0.466 | 0.381 | -0.750 | 0.020 | 0.708 | 0.637 | 1.000 |

**Table A2.** Multicollinearity Tests

*Source: Study Panel Data (2011—2021)*

## Statements and Declarations

### *Data Availability*

The data analyzed in this study were derived from publicly available annual reports of the sampled commercial banks and official publications of the National Bank of Ethiopia (NBE) for the period 2011-2021. Specific data requests can be directed to the corresponding author, subject to any confidentiality restrictions from the original sources.

### *Author Contributions*

Conceptualization, M.A. and Y.K.B.; methodology, M.A.; software, M.A.; validation, M.A. and Y.K.B.; formal analysis, M.A.; investigation, M.A.; resources, M.A. and Y.K.B.; data curation, M.A.; writing—original draft preparation, M.A.; writing—review and editing, Y.K.B.; visualization, M.A.; supervision, Y.K.B.; project administration, Y.K.B.

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