

Determinants of Bank Liquidity: Empirical Evidence on Ethiopian Commercial Banks

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Abstract

Liquidity management is considered as one of the top priorities in banks to ensure their ability to reach funds when needed in order to meet their customers' demands and meet their obligations at time. Therefore, this study aims to identify determinants of liquidity for commercial banks in Ethiopia. In order to achieve this aim, banks' balance sheets and income statements was analyzed in order to compute study variables. Liquidity, which is the dependent variable of study, expressed by two liquidity ratios as: liquid assets to total deposit (L1), and loans to deposits (L2). Therefore, the purpose of this research was to identify the factors determine Ethiopian commercial banks liquidity. The study has categorized the independent factors into bank specific factors and macro-economic factors. The bank specific factors include management efficiency, deposit, Bank Size, Capital adequacy, Profitability, asset quality, and loan growth. While, the macroeconomic factors include short term interest rate, interest rate spread, interest rate, Gross Domestic Product (GDP), general inflation and unemployment rate. The panel data was used for the sample of nine commercial banks in Ethiopia from 2007 to 2017 year and estimated using Fixed Effect Model (FEM), data was present by using descriptive statistics and the balanced correlation and regression analysis for liquidity ratios was conducted. The findings of the study show that, asset quality, GDP, and loan growth had statistically significant and negative relationship with banks' liquidity. profit and unemployment rate had statically positive significant impact on liquidity measured by variable L1. whereas interest rate spread and bank size had statically negative significant impact on L1 On the other hand capital adequacy had statistically significant and positive relationship with banks' liquidity measured by variable L2. While, inflation rate, and management efficiency had no statistically effect on bank liquidity. The study generally stresses the importance of internal management of liquidity risk of banks on a continuous basis, and specifically recommends balancing the bank's deposit taking and lending structure on the one hand and maintaining liquidity on the other. It also recommends to strengthening banks capital structure and control over operating expenses. Moreover, banks in Ethiopia should not only be concerned about internal structures and policies, but they must consider both the government regulation and the macroeconomic environment together in developing strategies to improve the liquidity position of the banks.

Keywords: Liquidity, Commercial banks, assets, loan

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1. Introduction

One of the central roles of banks is being a financial intermediary that facilitates credit to deficit users by channeling fund from surplus economic units. By this, banks are actually collecting short term deposit and issuing loans for long terms. This will create a liquidity problem to the bank. When a bank does not have enough liquidity to fulfill its obligation, the bank is said to face liquidity risk. Determining what is adequate liquidity for banking organizations has always been a rather subjective and difficult task, because banks rarely have liquidity problems as long as they are viewed as sound and deposit inflows are positive. Failure to properly manage liquidity can quickly result in significant unanticipated losses.

According to the Bank for International Settlements/BIS (2008), liquidity is defined as bank's ability to acquire funds required to meet obligations when due without incurring any substantial losses. It's an agreed fact that all businesses including banks face liquidity risk. The banks liquidity risk is evident from its operations of providing mismatched maturities of deposits and loans (short-term deposits for long-term loan). As a consequence, banks fundamentally need to hold not only an optimal level of capital but also liquidity to maintain efficiency and operative excellence.

Basel Committee (2008) defines Liquidity is the ability of a bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses. The fundamental role of banks in the maturity transformation of short-term deposits into long-term loans makes banks inherently vulnerable to liquidity risk, both of an institution-specific nature and that which affects markets as a whole. Virtually, every financial transaction or commitment has implications for a bank's liquidity.

In order to avoid liquidity crisis, management of business and financial institution in particular need to have a well-defined policy and established procedures for measuring, monitoring, and managing liquidity. Episodes of

failure of many conventional banks from the past and the present provide the testimony to this claim. For instance, as United States/U.S. subprime mortgage crisis reached its peak in the years 2008/9 unprecedented levels of liquidity support were required from central banks in order to sustain the financial system. Even with such extensive support, a number of banks failed, were forced into mergers or required resolution. A reduction in funding liquidity then caused significant distress. In response to the freezing up of the interbank market, the European Central Bank and U.S. Federal Reserve injected billions in overnight credit into the interbank market. Some banks needed extra liquidity supports (Longworth 2010; Bernanke 2008).

It is evident that liquidity and liquidity risk is very up-to-date and important topic, therefore banks and more so their regulators are keen to keep a control on liquidity position of banks. Liquidity in general is vulnerable and could be drained suddenly from a bank. Shortage in liquidity of a bank could spread out to other banks as by way of interbank transactions and create systemic risk. Shock in the financial market could spur spiral liquidity that deplete the liquidity in the market and create a financial crisis.

Therefore, this topic is interested to examine the determinants of bank liquidity how might the size of the bank liquidity buffers be influenced by bank specific factors and by macro factors. This empirical studies are essential to enable banks and regulators to keep control to the issue of liquidity which very important to the wellbeing of their operation as well as the economy as a whole in the country (Ethiopia).

2. Literature Review

2.1. Concept of Bank Liquidity

According to business dictionary, liquidity is a measure of the extent to which a person organization has cash to meet immediate and short-term obligation or assets that can be quickly converted to do this. Liquidity can also be measure of the ability and ease with which assets can be converted to cash. Liquid assets are those that can be converted to cash quickly if needed to meet financial obligations.

Adebayo et. al., (2011) contend that, liquidity includes three features namely Marketability, Stability and Conservatism.

The definitions above give the dimensions of liquidity as the time required to convert an asset into money, the certainty associated with the conversion and the price realized for the assets and the ability to meet obligations as and when they fall due without incurring losses. That is, a bank's liquidity lies in its liquid assets, its ability to obtain funds through deposits and capital injection.

2.2. The Role of Banks

In general, in inefficient markets, financial intermediation is beneficial since banks have lower monitoring and transaction costs than individuals, due to economies of scale and scope.

Where, one important aspect of banking is the function of maturity transformation. Banks receive short-term savings from depositors and transform those savings into long-term loans to borrowers. By holding a part of the short-term savings in liquid assets and cash, banks could withstand daily withdrawals from depositors. Banks offer a unique service; lending long term while guaranteeing the liquidity of their liabilities to depositors, which can withdraw their money at any time without a decline in nominal value (Schooner & Talyor, 2010 cited in van Ommeren, 2011). Capital markets cannot achieve maturity transformation with the same benefits as banks can. Individual investors face liquidity, price and credit risk, which they cannot diversify to the extent banks can. As savers do not withdraw their deposits at the same time, banks hold only a minor part of the savings in liquid cash. Thus, banks diversify liquidity risks over a large pool of savers. Individual savers can also diversify their investments in terms of credit and price risks but it remains unlikely that they could withdraw the investments at any time without facing liquidity issues.

Nowadays, bank activities are more diverse than ever. In the past decades, competition has increased and new activities have emerged. The traditional form of banking, receiving deposits and extending credits, has become less important. Ever since the complexity of balance sheet has increased, as did balance sheet and risk management (van Greuning & Bratanovic, 2009 cited in Ommeren, 2011). Besides the incorporations of liquidity, price and credit risks in banking activities, banks increasingly faces market risks (e.g. interest rate risk and currency risk). One may assume that banks' risk managers properly diversify these risks and closely monitor borrowers' behavior to avoid bank failure or financial distress. Nevertheless, monitoring bank behavior is required to safeguard the continuity and stability of the banking sector due to moral hazard issues.

2.3. Determinants of Bank Liquidity

2.3.1. Opportunity Cost of Liquidity Holdings

The early literature on bank's liquidity buffers views liquidity management at banks as akin to a standard inventory problem (Baltensperger (1980) and Santomero (1984). The costs of keeping a stock of liquid assets of a particular size are weighed against the benefit of reducing the chance of being „out of stock“. The key prediction of these theories is that the size of the liquidity buffer should reflect the opportunity cost of return

foregone from holding liquid assets rather than loans. It should also relate to the distribution of liquidity shocks the bank may face, and in particular to the volatility of the funding basis as well as the cost of raising funds (eg in the interbank market) at short notice. In an extension of this literature, Agenor et al (2004) test whether the credit crunch in Thailand, 1998 was related to supply or demand factors, and to this end estimate a banks' demand function for reserves. They derive a demand function for excess reserves that depends both on the distribution of the deposits withdrawals, the external cost of finance (penalty rates applied by the central bank) and the impact of regulation.

The determination of a bank's optimal liquidity buffer involves a trade-off between self-insurance against liquidity risk and the returns from illiquid, higher-yielding assets. Baltensperger (1980) as well as Santomero (1984) for instance argue that the size of bank's liquidity buffers is determined by the opportunity costs to hold liquid assets. Similar arguments can be found in Agénor et al. (2004) who shows, using aggregate data for Thailand, that bank's liquidity holdings are positively related to the volatility of the money market rate, which proxies the need for self-insurance.

2.3.2. Moral Hazard Motives

As noted above, banks have three possible layers of insurance; a buffer of liquid assets in banks' individual portfolios, unsecured lending/borrowing in the interbank market and central banks' Leander of Last Resort (LOLR). Repullo (2003) develops a model of strategic interactions between the central bank and one representative bank and shows that the presence of LOLR support may affect the bank's choice as regards the share of liquid assets in its portfolio. The central banks' objective is to trade off the fiscal cost of lending to the bank and the cost of the bank's failure. The bank's objective is to maximize the expected payoffs to its shareholders. Given this set-up, Repullo (2003) determines the equilibrium strategy of the bank taking into account the LOLR's response function and vice-versa. One finding is that, the choice among risky assets is not related to the presence of the LOLR. Nevertheless, the presence of a LOLR is shown to influence the level of the optimal buffer of liquid assets: the share of safe assets in the bank's portfolio decreases with the introduction of a LOLR.

In an empirical study, Gonzalez Eiras (2003) draws conclusions consistent with Repullo (2003). He examines how Argentinean banks changed the amount of their liquidity holdings and demands after a Repo Agreement was implemented at the end of 1996, which enhanced the ability of the central bank to act as LOLR. He finds that this particular event implied a reduction in the banks' liquidity holdings. That is, the greater the potential support from the central bank in case of liquidity crises, the lower the liquidity buffer the banks hold.

2.4. Bank Specific Characteristics

2.4.1. Profitability and Bank Liquidity

Profitability accounts for the impact of better financial soundness on bank risk bearing capacity and on their ability to perform liquidity transformation (Rauch et al. 2008 and Shen et al. 2010). A sound and profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system (Athanasoglou et al. 2005). One of the highest yielding assets of a bank is loans & advances that provide the largest portion of operating revenue. In this respect, banks are faced with liquidity risk since loans and advances are funds from deposit of customers. The higher the volume of loans & advances extended to customers, the higher the interest income and highest profit potentials for banks but it affects liquidity of the bank. Thus, banks need to strike a balance between liquidity and profitability.

2.4.2 Asset Quality and Liquidity

The asset quality reflects the existing and potential credit risk associated with the loan and investment portfolios. It's considered as one of the most critical variables that determine the overall condition of bank. Quality of loans affecting asset quality during those loans typically comprises a majority of banks assets (FDIC, 2017). Thus, the risk related to loans may affect bank liquidity through the failure in collecting principles of loans and interest; which may affect bank at a whole. This risk exposed by bank is known as "Transformation risk" while banks transfer less risky deposits to risky loans to meet its customers need of liquidity. The main contributor to liquidity risk is Non Performing loans where borrowers are unable to make loan repayments (Lee et. al., 2013). Quality of a bank loans can be measured by loan loss reserve to gross loans. Where the higher the ratio is the more problematic are the loans and vice versa (Cucinelli, 2013).

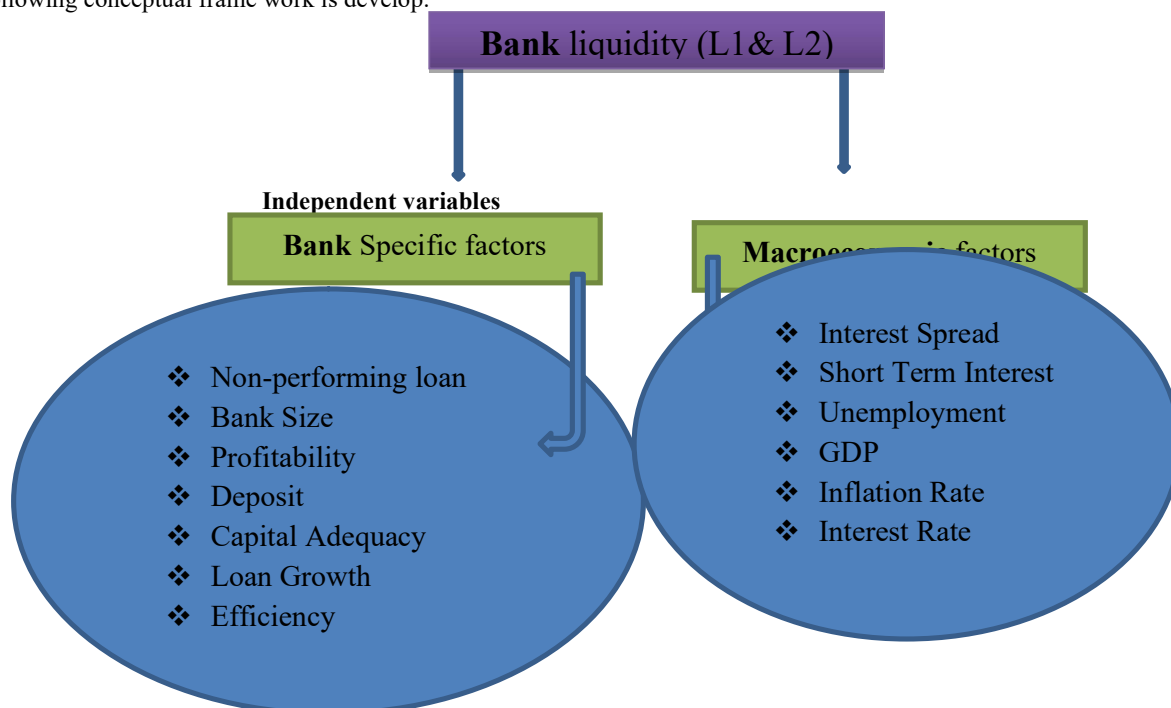
2.4.3 Capital Adequacy and Bank Liquidity

Capital can be defined as common stock plus surplus fund plus undivided profits plus reserves for contingencies and other capital reserves. Besides, a bank's loan loss reserves which serve as a buffer for absorbing losses can be included as bank's capital (Patheja 1994). The primary reason why banks hold capital is to absorb risk including the risk of liquidity crunches, protection against bank runs, and various other risks. According to Moh'd and Fakhri (2013), bank's capital plays a very important role in maintaining safety and solidarity of banks and the security of banking systems in general as it represents the buffer gate that prevents any unexpected loss that banks might face, which might reach depositors funds given that banks operate in a highly uncertain

environment that might lead to their exposure to various risks and losses that might result from risks facing banks. The recent theories suggest that, bank capital may also affect banks' ability to create liquidity. These theories produce opposing predictions on the relationship between capital and liquidity creation.

2.5. Conceptual Framework

On the basis of the hypotheses that developed from the literature part and the regression model of the study, the following conceptual frame work is develop.



Source: Self Developed Macroeconomic and specific factors,2019

As it was discussed in the literature review part, liquidity of banks can be affected by bank specific as well as macroeconomic factors. It was also discussed that some factors which have significant impact on liquidity of banks in one country may not have the same impact on another country. Thus it is important to identify the determinants of liquidity of Ethiopian commercial banks.

3. Research Methodology

The study has incorporated quantitative approach and has applied descriptive research type using the fact that a descriptive research design is used to describe the data and characteristic about "what is" being examined. Descriptive survey additionally empowers to acquire the present data. It is also used in fact finding studies and helps to formulate certain principles and give solutions to the problems concerning local or national issues.

Descriptive survey method concentrates on exploring the present status, practice and problems of the under study problem. The researcher used the sample of nine (9) commercial banks in Ethiopia and 2007 to 2017 year secondary data was collected from secondary data sources. The collected data was estimated using Fixed Effect Model (FEM), present by using descriptive statistics and the balanced correlation and regression analysis for liquidity ratios was conducted.

Therefore, this study attempted to measure liquidity by using two different liquidity measures similar to most of the aforementioned researchers by using stock approach due to its easiness and availability of data to measure banks liquidity. These are,

- ❖ *Liquid Assets to Total Deposits (L1) i.e., $L1 = \text{Liquid assets} / \text{Total deposits}$ and*
- ❖ *Total Loans to total deposits (L2) i.e., $L2 = \text{Total loans} / \text{Total deposits}$*

The researcher developed multiple linear regression model ($Y_{it} = \alpha + \beta \cdot x_{it} + u_{it} + \epsilon$, Where; Y_{it} represents dependent variables; subscript I denote the cross-section and t representing the time-series dimension; x_{it} is a vector of explanatory variables for bank i in time t ; α is constant; β are coefficient which represents the slope of the explanatory variables and u_{it} is the error term.

An OLS panel data regression analysis is used to identify the determinants of commercial bank liquidity in Ethiopia by estimating the following equations: as follows:

$$L1_{i,t} = \alpha + \beta_1(Prit) + \beta_2(ASQ_{it}) + \beta_3(CAP_{it}) + \beta_4(BSIZE_{it}) + \beta_5(Lgit) + \beta_6(DEP_{it}) + \beta_7(GDP_t) + \beta_8(IRT) + \beta_9(INF_{it}) + \beta_{10}(IRTSPD_{it}) + \beta_{11}(UNR_{it}) + \beta_{12}(SIR_{it}) + \beta_{13}(MEU_{i,t}) + U_{it}$$

.....**model 1**

$$L2_{i,t} = \alpha + \beta_1(Prit) + \beta_2(ASQ_{it}) + \beta_3(CAP_{it}) + \beta_4(BSIZE_{it}) + \beta_5(Lgit) + \beta_6(DEP_{it}) + \beta_7(GDP_t) + \beta_8(IRT) + \beta_9(INF_{it}) + \beta_{10}(IRTSPD_{it}) + \beta_{11}(UNR_{it}) + \beta_{12}(SIR_{it}) + \beta_{13}(MEU_{i,t}) + U_{it}$$

.....**model 2**

Where, LIQ_{it} is liquidity ratio measured by L1 & L2 for *i*th bank on year *t*. α = constant term
 $\beta_1, 2, 3, \dots$ coefficient

- ❖ Prit = is the profitability for bank *i* at time *t*.
- ❖ ASQ_{it} = is the asset quality for bank *i* at time *t*.
- ❖ CAP_{it} = is capital adequacy for bank *i* at time *t*.
- ❖ BSIZ_{Eit} = is the size for bank *i* at time *t*.
- ❖ Lgit = is the loan growth for bank *i* at time *t*.
- ❖ GDP_t = is the real domestic product/GDP growth of Ethiopia on the year *t*.
- ❖ IRTSPD_t = is interest rate spread on the year *t*.
- ❖ INFL_t = is the overall inflation rate in Ethiopia on the year *t*.
- ❖ IRT = is interest rate at a time *t*.
- ❖ UNR_{it} = is UN employment rate of Ethiopia on the year *t*
- ❖ SIR_{it} = is short term interest rate a time *t*
- ❖ dep_{it} = deposit for *i* at time *t*
- ❖ (MEU_{i,t}) = management efficiency
- ❖ U_{it} = is a random error term

Among the above models, the first model, in which liquidity is measured by liquid asset to deposit (L1), was used as a benchmark in this study while liquidity which is measured by loan to total deposit ratios are used for robustness check. This ratio is also favored by the National Bank of Ethiopia in which the liquidity requirement directive is issued based on this ratio.

Both descriptive statistics and inferential statistics method of data analysis methods was applied. Significant levels were measured at 95% confidence level with significant differences recorded at $p < 0.05$. Hence, based on the objective, the hypotheses proposed about the possible determinants of liquidity for commercial banks in Ethiopia are as follows. That is:-

Hypothesis:

- H1: Capital adequacy has statistically positive and significant impact on bank liquidity.*
- H2: Bank size has statistically negative and significant impact on bank liquidity.*
- H3: Asset quality has statistically negative and significant impact on bank liquidity*
- H4: Profitability has statistically negative and significant impact on bank liquidity.*
- H5: Real gross domestic product has statistically negative and significant impact on bank liquidity.*
- H6: Interest rate spread has statistically negative and significant impact on bank liquidity.*
- H7: Inflation has statistically positive and significant impact on bank liquidity.*
- H8: Loan growth has statistically negative and significant impact on bank liquidity.*
- H9: Unemployment rate has negative and significant impact on bank liquidity.*
- H10: deposit has negative and significant effect on bank liquidity.*
- H11: Interest rate on has positive and significant impact on bank's liquidity*
- H12: Short term interest rate has positive and significant impact on bank's liquidity*
- H13: Management efficiency has a significant effect on bank liquidity.*

Variable Measurement

Table 3.1 Internal and external factors and their hypothesized relationship

Variable	Measure	Notation	Hypothesized Relationship
Dependent variables			
Liquidity ratio 1	Total liquid assets to total deposits	L1	NA
Liquidity ratio 2	Total loans & advances to total deposits	L2	NA
Independent variables			
Bank-specific variables			
Profitability	Net income after tax/total assets	PR	-
Asset quality	Loan loss reserve to gross loans.	ASQ	-
Capital adequacy	Equity/ total assets ratio	CAP	+
Bank Size	Natural logarithm of bank's total assets	BSIZE	+
Loan growth	Annual change in total loans	LG	-
Short term interest rate	Annual weighted average interest rate of Treasury Bills	SIR	+
Deposit	Total Deposits to Total Assets	Dep	-
Management efficiency	Cost to Income Ratio (Noninterest Expenses (Operating cost)/Total Revenue)(Interest received-interest expenses/total deposits incurred)/ total assets	EF	-
Macroeconomic variables			
Economic growth	Growth rate of real GDP	GDP	-
Interest rate	Interbank assets to interbank liquidity	BL	+
Interest rate spread	Interest rate on loans minus interest rate on deposits	IRS	-
Inflation	Annual inflation rate of Ethiopia	INFR	+
Unemployment	Unemployment rate	UNR	-

4. Results and Discussion

4.1. Descriptive statistics

Table3.2.Descriptive Statistics of L1 and L2

Variable	Minimum	Maximum	Median	Mean	Std. Deviation	Observations
Liquidity 1	0.088746	1.377049	0.382363	0.43273	0.203591	99
Liquidity 2	0.296870	0.967004	0.604683	0.617771	0.124749	99
PR	-0.018797	0.263078	0.026545	0.029432	0.030170	99
Asset quality	0.000000	0.142330	0.021473	0.023887	0.022796	99
CAP	0.037436	0.507519	0.118277	0.128852	0.057629	99
LG	-0.108800	1.576553	0.231864	0.297106	0.273151	99
Bsize	266000000	490210796605	9732578000	30551794757	74981251794	99
Efficiency	0.160179	2.315789	0.426850	0.486368	0.246764	99
Deposit	0.458647	0.844294	0.765515	0.757770	0.055119	99
Sh.interest rate	0.036385	0.056200	0.054300	0.050529	0.006023	99
Interest rate spread	0.004492	0.084433	0.040032	0.040621	0.016856	99
Inflation rate	0.066000	0.444000	0.099000	0.162091	0.120184	99
Employment rate	0.049800	0.524700	0.052000	0.098964	0.135969	99
GDP	0.065000	0.116000	0.08500	0.08718	0.017179	99
IR	0.105000	0.127500	0.118800	0.119455	0.005899	99

Source: Commercial banks reports, NBE, MoFED, 2019

Table 3.2 describes the descriptive statistics for the dependent and independent variables, which also reveals all variables comprised 99 observations. The dependent variables are liquidity measured by liquid assets to total deposits ratio/L1 and total loans to total deposits ratio/L2. The remaining variables are the independent variables such as: profitability, capital adequacy, bank size, loan growth, management efficiency, deposit, short term interest rate, interest rate spread, general inflation rate, unemployment rate, real GDP growth, and asset

quality. The mean value of L1 was 43.27% which was by far above the statutory requirement of 15% set by NBE under NBE Directives No. SBB/57/2014. The standard deviations of 20.35% showed high dispersion of liquid assets to total deposits ratio from its mean for the banks in Ethiopia. The minimum and maximum values of L1 were 8.87% and 137.70%, respectively. The mean value of L2 was 61.35% which is considerably lower than the international standard for loans to deposit ratio (i.e. 75% (CBRC 2012).

This indicates on average for the commercial banks in Ethiopia had rational amount of volatile liabilities/deposits were tied up with illiquid loans. There was high dispersion of L2 towards its mean value among banks that is shown by the standard deviation of 12.47%. The 44 maximum value of L2 was 96.70% which is far above the standard whereas the minimum value was 29.68% which is far below the standard. This indicates that there were some commercial banks in Ethiopia having extra liquidity (banks around 30% L2) and others were going to face liquidity shortages/risk (banks around 96.7% L2). Therefore, it can be concluded that loans to deposit ratio was high dispersed among commercial banks in Ethiopia.

4.3 Correlation Analysis among Dependent and Independent Variables

Hypothesis test

$H_0: \rho=0$ (No correlation)

$H_1: \rho \neq 0$ (there is correlation)

Table 3.3 Correlation Analysis of L1 sand L2

Independent Variables and dep.v		Dependent Variable					
		L1			L2		
	L1	1	Sig	decision	P.correlation(R)	Sig	Decision
	L2	p.Correlation®			1		
1	UNE	-0.263	.0081	Reject H0	0.0896	0.3773	Do not Reject Ho
2	SIR	-0.579	.0000	Reject Ho	-0.2727	.0063	Reject Ho
3	PR	-0.257	.0100	Reject Ho	-0.2069	.0398	Reject Ho
4	LG	-0.114	.2610	Do not Reject Ho	0.1337	.1868	Do not Reject Ho
5	IRS	-0.177	.0795	Do not Reject Ho	0.2068	.0399	Reject Ho
6	IR	-0.355	.004	Reject Ho	-0.30	.0025	Reject Ho
7	IFR	0.3060	.0021	Reject Ho	0.0859	.3975	Reject Ho
8	GDP	0.1144	.02594	Reject Ho	0.4059	.0000	Reject Ho
9	EF	0.2928	.0033	Reject Ho	0.2142	.0332	Reject Ho
10	DEP	-0.4389	.0000	Reject Ho	-0.1279	.0270	Reject Ho
11	CAP	0.4856	.0000	Reject Ho	0.25	.0122	Reject Ho
12	BSIZE	-0.6515	.0000	Reject Ho	-0.4167	.0000	Reject Ho
13	AS.QU	0.3904	.0001	Reject Ho	-0.095	.3467	Do not Reject Ho

Source: Commercial banks reports, NBE, MoFED, 2019

The table 3.3 clearly reveals a liquid asset to total ratio/L1/ was correlated with most of the independent variables except IRS and LG. The dependent variable L1 positively correlates with IFR,GDP,EF,CAP, Bsize and AS.QU However, negatively correlates with the rest variables. L2 results have to be interpreted in reverse: positive sign of the coefficient means negative linear relationship with liquidity and conversely. With regard to L2, it correlated with most of the independent variable except UNE, LG and Asset quality.

4.4. Results of Regression Analysis

According to Gujarati (2004), if the number of time series data is large and the number of cross-sectional units is small, there is likely to be little difference in the values of the parameters estimated by fixed effect model and random effect model. Accordingly in this study, the number of cross section units is nine and the number of time series data is eleven which is more than the cross section unit and as the sample of commercial banks were not selected randomly, the fixed effect model is more appropriate than the random effect model and then the fixed effect model is used in this study.

This section discusses the regression results of fixed effect model that determines the liquidity of commercial banks in Ethiopia. In this study, liquidity is measured by the ratio of liquid asset to total deposit (L1) and total loans & advances to total deposits L2

Determinants of Bank Liquidity Measured by Model- 1

The empirical model used in this study to identify the statistically significant determinants of Ethiopian private commercial banks liquidity measured by liquid asset to deposit (L1) was:

$$L1_{i,t} = \alpha + \beta_1(Prit) + \beta_2(IRS_{it}) + \beta_3(CAP_{it}) + \beta_4(BSIZE_{it}) + \beta_5(Lgit) + \beta_6(GDP_t) + \beta_7(IR_{it}) + \beta_8(INFL_t) + \beta_9(ASQ_{it}) + B10(UNR_{it}) + B11(SIR_t) + B12(DEP_{it}) + B13(Efi_t) + \delta_i + \epsilon_{it} \dots \dots \dots \text{(Model 1)}$$

The following table presents the regression result of the determinants of commercial bank's liquidity measured by the ratio of liquid asset to deposit (L1).

Table 3.4: Regression results of liquidity measured by L1 Dependent Variable: L1

Method: Panel Least Squares				
Date: 05/14/19 Time: 14:22				
Sample: 2007 2017				
Periods included: 11				
Cross-sections included: 9				
Total panel (balanced) observations: 99				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.655917	0.893406	4.092111	0.0001
SIR	-3.018598	3.976037	-0.759198	0.4501
UNR	0.234361	0.101410	2.311028	0.0235**
PR	0.335104	0.459010	0.730057	0.4676
LG	-0.205067	0.045348	-4.522094	0.0000***
IRT_SPD	-2.461539	0.899212	-2.737441	0.0077***
IR	9.229061	3.095419	2.981523	0.0038***
INF	0.102288	0.108147	0.945823	0.3472
GDP	-1.702906	0.936108	-1.819134	0.0728*
EF	-0.084257	0.090638	-0.929596	0.3555
DEP	-1.153433	0.374933	-3.076373	0.0029***
CAP	0.566738	0.642047	0.882705	0.3801
BSIZE	-0.136736	0.035323	-3.870978	0.0002***
ASSET_QU ALITY	3.208675	0.710962	4.513149	0.0000***

Effects Specification			
		Cross-section fixed (dummy variables)	
R-squared	0.810206	Mean dependent var	0.432730
Adjusted R-squared	0.758444	S.D. dependent var	0.203591
S.E. of regression	0.100062	Akaike info criterion	-1.572932
Sum squared resid	0.770948	Schwarz criterion	-0.996239
Log likelihood	99.86016	Hannan-Quinn criter.	-1.339601
F-statistic	15.65252	Durbin-Watson stat	1.472715
Prob(F-statistic)	0.000000		

***, ** and * denote significance at 1%, 5%, and 10% levels, respectively

Source: Financial statement of sampled commercial banks and own computation through E-views 9

Table 3.4 above shows the results of the regression analysis on the determinant of the dependent variable (liquidity) which was measured by the ratio of liquid asset to deposit and the independent variables includes both bank specific variables and macroeconomic variables for the sample of nine commercial banks in Ethiopia.

The coefficient of determination in this model is given by R-squared of 0.810206 and Adjusted R-squared of 0.758444, which means 81% of variation of Ethiopian commercial bank's liquidity (L1) can be explained by the variation on unemployment, short term interest rate, profit, loan growth, interest rate spread, interest rate, inflation rate, GDP, efficiency, deposit, asset quality, capital adequacy, bank size. The remaining 19% of changes was explained by other determinants which are not included in this model. Thus, the explanatory power of the model is high. The value of F-statistics is 15.65252 with p-value of 0.000000 which is used to measure the overall significance of the model (Model adequacy).

Thus, the p-value of F-statistics is zero at six digits, the null hypothesis is rejected and the model is significant even at 1% significant level. As it is shown on table 3.4 above, bank size (SIZE), loan growth (LG), asset quality (ASQ), Interest rate spread (IRS) Deposit, interest rate (IR) and unemployment had statistically significant factors affecting liquidity of Ethiopian commercial banks which is measured by L1. Among the

statistically significant variables, bank size (SIZE) loan growth (LG), deposit, and interest rate spread had negatively related with liquidity (L1).

As it can be seen from the table, bank size represented by the logarithm of total assets is the variable which has a negative significant relation with L1 (loan to total deposit with the coefficient value of -0.136736. This slight impact indicates that an increase of one unit in bank size decreases the L1 ratio by -0.136736 units. However, many scholars have concluded the same results by using different samples from different countries like Deléchat et al. (2012) in Central America, Giannotti et al. (2011) in Italy, Vodova (2012) in Poland, and Vodova (2013) in Hungary. Indeed, the negative relationship between bank size and liquidity ratio is usually attributed to the theory of “too big to fail”. In that sense, bigger banks in Ethiopia are less motivated to hold liquid assets since they predict that the Central Bank and the government will intervene to rescue these banks in the case of liquidity shortage.

Asset quality has positively related with liquidity (L1) which refers to the quality of bank loans. This ratio has a positive coefficient of 3.208675, which indicates that an increase of one unit in this ratio will cause the liquidity ratio L1 (The ratio of liquid assets to total deposits) to be increased by 0.167005 units. Since a higher value of this ratio reflects a more problematic loan, this means that a better liquidity situation is crucial for banks to avoid the insolvency. The same conclusion was found by Mehmet (2014) who attempted to identify the determinants of liquidity risk in Bosnia and Herzegovina by utilizing two liquidity measures, and likewise this study he has approved the positive impact of loan loss profession on only one of the two liquidity measurements.

Interest rate (IR) has positively related with liquidity (L1). The above table also depicts that, bank size (SIZE), loan growth (LG), asset quality (ASQ), Interest rate spread (IRS) Deposit, and interest rate (IR) had statistically significant influence on Ethiopian commercial bank's liquidity (L1) at 1% significant level. The other statistically significant variables,

Unemployment rate (UNE) had statistically significant impact on liquidity (L1) at 5% significant level. GDP had statistically significant impact on liquidity (L1) at 10% significant level. The other variables such as capital adequacy (CAP), efficiency (EF), inflation rate (IFR), profit (PR), and short term interest rate (SIR) were statistically insignificant impact on liquidity (L1).

Determinants of Bank Liquidity Measured by Model- 2

The empirical model used in this study to identify the statistically significant determinants of Ethiopian commercial bank's liquidity measured by Total loans & advances to total deposits ratio was:

$$L2i,t = \alpha + \beta1(Prit) + \beta2(IRSit) + \beta3(CAPit) + \beta4(BSIZEit) + \beta5(Lgit) + \beta6(GDPt) + \beta7(IRit) + \beta8(INFLt) + \beta9(ASQit) + \beta10(UNRit) + \beta11(SIRt) + \beta12(DEPit) + \beta13(Efi,t) + \delta i + \epsilon it \dots\dots\dots(\text{Model 2})$$

The following table shows the regression result of the determinants of commercial bank's liquidity measured by the ratio of Total loans & advances to total deposits.

Table 3.5: Regression result of liquidity measured by L2 Dependent Variable: L2

Method: Panel Least Squares

Date: 05/16/19 Time: 23:24

Sample: 2007 2017

Periods included: 11

Cross-sections included: 9

Total panel (balanced) observations: 99

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.205360	0.741733	1.625058	0.1082
UNR	-0.091478	0.084194	-1.086522	0.2806
SIR	-8.818916	3.301028	-2.671566	0.0092***
PR	0.067598	0.381085	0.177383	0.8597
LG	0.080466	0.037649	2.137258	0.0358**
IRT_SPD	0.496395	0.746553	0.664916	0.5081
IR	-6.211320	2.569912	-2.416939	0.0180**
INF	0.019928	0.089787	0.221947	0.8249
GDP	2.186685	0.777186	2.813594	0.0062***
EF	0.133832	0.075251	1.778476	0.0793*
DEP	-0.765204	0.311281	-2.458245	0.0162**
CAP	-1.414815	0.533047	-2.654205	0.0097***
BSIZE	0.048094	0.029327	1.639944	0.1051
ASSET QUALITY	-1.760755	0.590262	-2.983004	0.0038***

Effects Specification

Cross-section fixed (dummy variables)			
R-squared	0.651566	Mean dependent var	0.617771
Adjusted R-squared	0.556539	S.D. dependent var	0.124749
S.E. of regression	0.083074	Akaike info criterion	-1.945036
Sum squared resid	0.531402	Schwarz criterion	-1.368342
Log likelihood	118.2793	Hannan-Quinn criter.	-1.711705
F-statistic	6.856612	Durbin-Watson stat	1.583565
Prob(F-statistic)	0.000000		

***, **, and * denote significance at 1%, 5%, and 10% levels, respectively Source: Financial statement of sampled commercial banks and own computation through E-views 9

Table 3.5 above, presents the determinants of Ethiopian commercial banks liquidity measured by the ratio of loans to total deposit. In contrast to the above liquidity measures L1, high value of this ratio implies low liquidity and the result have to be interpreted in reverse: positive sign of the coefficient means negative impact on liquidity and conversely. As it is depicted in the above table, the R-square and adjusted R-square of the model was 0.651566 and 0.556539 respectively. This result implies that, the explanatory power of the model is high and indicates that the change in the independent variables can explain 65.15% of the change in the dependent variable. The value of F-statistics is 6.85 with p-value of 0.000000 which is used to measure the overall significance of the model.

Thus, the p-value of F-statistics is zero at six digits, the null hypothesis is rejected and the model is significant even at 1% significant level. As it can be seen from the above table short term interest rate(SIR), asset quality (ASQ),GDP and capital adequacy were statistically significant at 1% significant level, deposit, interest rate and loan growth were statistically significant at 5% significant level. And efficiency was significant at 10% significant level. Whereas, inflation rate, profit and interest rate spread had statistically insignificant impact on banks liquidity measured by L2. Among the statistically significant variables which determine liquidity in the case of L1, interest rate, asset quality, GDP, and loan growth had similar significant impact on liquidity measured by L2.

As it is shown on table 4.8 above, among the independent variables, deposit, asset quality, interest rate, capital adequacy, and short term interest rate had negatively related with liquidity (L2) and indicate their positive impact on liquidity of Ethiopian commercial banks which means the increase in this independent variables will leads to the decrease in liquidity of commercial banks. The other variables; interest rate spread, loan growth, GDP, profit, bank size and efficiency had positively related with liquidity which is measured by loan to deposit ratio and have negative impact on liquidity. In general among the specific factor variable profit had no statistically significant effect on L2. In addition, from macroeconomic variables inflation rate had no statistically significant effect on the liquidity of Ethiopian commercial banks in all of the two liquidity measures while the

other macroeconomic variables and the entire bank specific variables included in this study had statistically significant impact on liquidity of Ethiopian commercial banks at least in one of the two liquidity measures stated above.

4.5. Discussion of the Regression Results

4.5.1 Discussion of the Regression Results for Model L1

In this section, the relationship between the dependent variable and each independent variable were discussed on the basis of the findings on this study.

4.5.1.1. Bank Specific Factors

❖ Loan Growth Rate and Bank's Liquidity

As lending is the principal business activity of commercial banks, loans & advances is the major asset of a bank. In this study, the annual growth rate of gross loans and advances to customers was used as a proxy for loan growth. The result of the study indicated that, loan growth had a negative and statistically significant impact on liquidity of Ethiopian commercial banks measured by L1 at 1% significant level. The negative relation and statistically significant impact of loan growth on liquidity was in line with hypothesis. The negative impact of loan growth on liquidity was based on the argument that, when loans & advances of a bank increases, the amount of illiquid asset in the total asset portfolio would also increase and leads to reduction on the level of liquid asset position of the bank. This negative sign of the coefficient indicates an inverse relationship between loan growth and liquidity. According to the regression result, a 1% change in the loan growth rate, keeping other things constant had resulted in 0.2050 changes on the level of liquidity of commercial banks measured by L1 in the opposite direction.

❖ Deposits:

The probability value "Sig." is equals (0.0029) which is lower than (0.05). Hence, this variable is statistically significant. Since the sign of the test is negative, then there is significant negative effect of the variable Deposits on L1. Therefore, researcher accepts the hypothesis that deposit has negative and significant effect on bank liquidity. The researcher assumes that this behavior is due to the fact that banks investing higher level of funds in less liquid elements such as credit facilities and various low-liquidity investments with long maturities. Our result is contrary to other researcher's findings like Bonner et al. (2013), Singh and Sharma (2016) who found a positive effect of deposits on bank liquidity.

❖ Bank Size:

For the variable "Bank Size", the probability value "Sig." equals (0.0002) which is less than (0.05). So, this variable is statistically significant. The sign of the test is negative as a result there is significant negative effect of the variable SIZE on L1. Therefore, the researcher accepts the hypothesis that Bank size has statistically negative and significant impact on bank liquidity.

The researchers found that bank size shows a negative relationship on Ethiopian commercial bank liquidity ratio, which means the higher the bank size, the lower the liquidity ratio. This is consistent to prior research, as in Deléchat (2011) studies.

❖ Asset Quality:

The probability value "Sig." equals (0.0000) which is less than (0.05). Hence, this variable is statistically significant. As the sign of the test is positive, there is significant positive effect of the variable Asset Quality on L1 (Note: the higher this ratio is the more problematic banks loans. Therefore, the researchers rejected the hypothesis that, Asset quality has statistically negative and significant impact on bank liquidity. Keeping other factors constant as asset quality increase by 1%, Bank liquidity increase by 3.208. However, the weak relationships between the quality of the bank assets and its liquidity seen in Ethiopian banks is due to the difference in credit policy between banks according to their ownership.

4.5.1.2 Macroeconomic Factors Bank

❖ Interest Rate and Bank's Liquidity

Interest rate on loans & advances as a fraction of total outstanding loans & advances was taken as a measure for interest rate on loans (IRL). The result of the regression shows that, interest rate on loans & advances had positive and significant impact on commercial banks liquidity measured by L1. Keeping other factors constant as bank deposit interest rate increase by 1%, the amount of bank deposit increase by 9.22. Because people deposits more money to be beneficiary from the high interest rate set by banks. Hence, bank liquid asset grow more.

❖ Interest Rate Spread

The probability value "Sig." equals (0.0077) which is lower r than (0.05), accordingly, this variable is statistically significant. The sign of the test is negative so there is significant negative effect of the variable Interest Rate Spread on L1. Therefore, researcher accepts the hypothesis that Interest rate spread has statistically negative and significant impact on bank liquidity. Keeping other things constant, 1% change in interest rate spread cause 2.46 decrease in banks liquidity. Because no one is happy to deposit his/her money at low bank deposit interest rate.

❖ **Unemployment Rate**

The probability value "Sig." equals (0.0235) of variable measured by liquid asset to total deposit L1 is lower than (0.05). Hence, variable is statistically significant. Since the sign of the test is positive, and then there is significant positive effect of the variable Unemployment Rate on L1.

Therefore, keeping other things constant a 1% decrease in unemployment rate leads to 0.234% increase in bank liquidity. When unemployment increase the withdrawal of cash from deposit also increase. Because those unemployed use their deposit for consumption and this leads to reduce investment opportunity.

4.5.2 Discussion of the Regression Results for Model L2

4.5.2.1 Bank Specific Factors

NOTE: high value of ratio (L2) means low liquidity; thus, results have to be interpreted in reverse: e.g. Positive sign of the coefficient means negative impact on liquidity and conversely. - The multiple regression analysis shows that, the coefficient of determination for model (2)

R-Square = 65.15%. This means 65.15% of the variability in the dependent variable L2 (Loans to total Deposits) is explained by all of the independent variables together.

❖ **Capital Adequacy**

For the variable "CAPITAL ADEQUACY", the probability value "Sig." equals (0.0097) which is less than (0.05). Hence, this variable is statistically significant. As the sign of the test is negative, there is significant positive effect of the variable CAPITAL ADEQUACY on L2. Therefore, researcher accepts the hypothesis that Capital adequacy has statistically positive and significant impact on bank liquidity measured by variable L2.

As mentioned earlier, the positive relation between bank liquidity and its capital is related to the transformational role of banks by transforming liquid liabilities to illiquid assets in order to meet customers' need of liquidity, which makes the bank vulnerable to liquidity risks and likely needs to hold more capital to militate against the risk of losses. This means that the higher capital ratio raises bank capacity to absorb risks, which is considered as a positive signal to external public and enables bank to attract new deposits which make banks do their liquidity creation role and likely to hold more liquid assets in the short horizon in order to be able meet their short-term obligations.

❖ **Loan Growth Rate and Bank's Liquidity**

Loans are the bank's main investment, and loans are instrumental in the determination of the bank's future cash flows (Zemel, 2012). The probability value of loan growth equals (0.0358) which is less than (0.05) which mean that this variable is statistically significant. The test is positive and that indicates that there is significant negative effect of the variable LOANS GROWTH on L2. Therefore, researcher rejects the hypothesis that Loan growth has statistically negative and significant impact on bank liquidity and concluded that Loan growth has statistically negative and insignificant impact on bank liquidity measured by variable L2. This means loans are illiquid assets, which confirms that positive loan growth translates into an increase in illiquidity over a long term. Loan growth is thus dependent on the amount of liquidity banks hold (Pilbeam, 2005). This shows that Ethiopia commercial banks compensate for the reduction in loan demand by holding more liquid assets. During a season of high loan growth, Ethiopian commercial banks would hold less liquid assets, thus confirming that an increase in loans would result in Ethiopian banks holding less liquid assets. The results are also in line with the theory from the studies conducted by Cornett et al. (2010), which highlighted the negative relationship between loan growth and bank liquidity.

❖ **Asset Quality**

For the variable "ASSET QUALITY", the probability value "Sig." equals (0.0038) which is less than (0.05). Hence, this variable is statistically significant. As the sign of the test is negative, there is significant negative effect of the variable ASSET QUALITY on L2 (Note: the higher this ratio is the more problematic banks loans. Thus, we interpret this ratio directly). Therefore, researcher accepts the hypothesis that Asset quality has statistically negative and significant impact on bank liquidity measured by L2.

❖ **Interest Rate**

For the variable "interest rate", the probability value "Sig." is equals (0.0180) which is lower than (0.05). Hence, this variable is statistically significant. Since the sign of the test is negative, then there is significant positive effect of the variable interest on L2. Therefore, researcher accepts the hypothesis that: Interest rate on has positive and significant impact on bank's liquidity on L2.

❖ **Deposits**

For the variable "DEPOSITS", the probability value "Sig." is equals (0.0162) which is lower than (0.05). Hence, this variable is statistically significant. Since the sign of the test is negative, then there is significant positive effect of the variable deposits on L2. Therefore, researcher accepts the hypothesis that deposit has negative and significant effect on bank liquidity measured by L2. This means that banks are increasing their liquidity reserves in a direct way with the increase of deposits. The researcher assumes that this behavior is due to the fact that banks are not investing higher level of funds in more illiquid elements.

4.5.2.2 Bank Specific Factors

❖ GDP Growth

GDP growth is a measure of total economic activity in an economy (Mugomba et al., 2013). The probability value of GDP was equals (0.0006) which is lower than (0.05). Hence, this variable is statistically significant. The sign of the test is positive and that means that there is significant negative effect of the variable GDP on L2. Therefore, researcher rejects the hypothesis that real gross domestic product has statistically negative and significant impact on bank liquidity measured by variable L2. The findings are in line with other researcher's findings like Trenca et al. (2012), Munteanu (2012), and Tseganesh (2012) who did not find a significant relationship between growth rate of GDP and bank liquidity.

5. CONCLUSIONS

The main objective of this study was to identify the macroeconomic and bank specific determinants of liquidity of Ethiopian commercial banks. To comply with the objectives of the study, seven bank specific and six macroeconomic variables were used. The bank specific variables includes; capital adequacy, bank size, loan growth, asset quality, profitability, deposit, management efficiency, and the macroeconomic variables were unemployment, interest rate spread, interest rate, GDP, inflation rate and short term interest rate. The study was used panel data for the sample of nine commercial banks in Ethiopia which had eleven years of banking service over the period 2007 to 2017. The bank specific data were mainly collected from annual audited financial reports of the respective sample banks and the macroeconomic data were collected from NBE and MoFED. Data was presented and analyzed by using descriptive statistics, correlation analysis and balanced fixed effect regression analysis to identify the determinants of liquidity of Ethiopian commercial banks which were measured by liquid asset to deposit (L1 and loan to total deposit ratio (L2).

The result of this study confirmed that, among the bank specific variables; loan growth, deposit, asset quality, and interest rate had statistically significant impact on the determination liquidity of Ethiopian commercial banks. The coefficient sign for loan growth revealed negative relationship with liquidity and it was in line with our hypothesis and the finance theory.

Deposit has a significant effect on both Liquid Assets to total deposit (L1) and equity to total deposit (L2) means banks are increasing their liquidity reserves in a direct way with the increase of deposits

GDP had statistically negative impact on liquidity of Ethiopian commercial banks. Profit and unemployment positively significant impact on liquidity measured by variable L1 Whereas

Interest rate spread and bank size had negative significant impact on liquidity measured by variable L1. The negative relationship between bank size and liquidity was consistent to our hypothesis as well as the "too big to fail" hypothesis. However, Inflation rate had no statistically significant impact on the determination of liquidity of Ethiopian commercial banks.

In accordance with expectation of study, capital adequacy and inflation showed positive relationship with banks liquidity. The positive influence of the share of capital on total assets is consistent with the assumption that bank with sufficient capital adequacy should be liquid, too. The positive and statistically significant impact of inflation was based on the argument stating that in the inflationary economy, economic units including banks refraining from long term investments due to the decline in the real value of their investments that aggravate the credit market rationing and prefer to hold risk free/liquid assets. Management Efficiency had significant effect on liquid asset to total deposit L1 at 10% significance level.

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