INNOVATIONS

Empirical Investigation on the Impact of Liquidity on bank Profitability: Evidence from Commercial banks in Ethiopia

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Abstract

This study sought to investigate impact of liquidity on profitability of commercial banks in Ethiopia from 2002 to 2017. The study used return on asset, return on equity & net interest margin ratio to measure bank profitability &liquid asset to asset ratio, liquid asset to deposit ratio, credit to deposit ratio& deposit to asset ratio to measure bank liquidity based on secondary data obtained from income statement and balance sheet of six commercial banks. The study used panel data regression analysisby applying random & fixed effectas estimation techniquesto analysis data. Findings obtained from regression analysis revealed positive impact of LAR on ROA &ROE both under random & fixed effect regression analysis. However, LAR was found to have a negative impact on NIMR under random effect & fixed effect. Findings of the study also revealed negative impact of LDRon ROA &ROE both under random effect & fixed effect. On the other hand, it was found to have a positive impact on NIMR both under random and fixed effect respectively. Findings of the study also revealed positive impact of CDR on ROA & NIMR & negative impact of on ROE under random effect&positive impact on ROA, ROE & NIMR under fixed effect. Findings of the study further revealed that a negative impact of DAR both on ROA & NIMR &positive impact on ROE both under random &fixed effect respectively.The study recommends that it wouldbe moreadvisable for banksto formulate and implement financial policies that will help them tomaintain appropriate balance between liquidity and profitability.

Key words: 1. Liquidity & Profitability 2. Impact of liquidity on profitability 3.Bank Liquidity

Introduction

The impact of liquidity on the profitability of banking industry is unresolved issue in the banking literatures. To investigate empirical relationship between liquidity and profitability ofbanking industry, extensive studies have been conducted by various researchers in different countriesthrough various estimation techniques.However, no consensus has been reached among studies on the arearegarding to empirical impact of liquidity on the profitability of banking industry. Evidences suggest that researchers on the area are highly divided on the impact of liquidity on the profitability of banking industry.According to evidences obtained from accessible literatures on the area, the relationship between liquidity and profitability has remained a controversial issue in the existing literatures on the area.As stated by Mishra & Pradhan (2019), the trade-off between liquidity and profitability has been a burning issue in the field of banking sector. According to evidences

obtained from accessible literatures on the area, no conclusive findings haven been obtained by previous researchers regarding to the impact of liquidity on bank profit.

As it can be evidenced empirical studies on the area, considerable level of inconsistent findings has been reported by various researchers. As stated byHina(2015),the relationship between liquidity and profitability has remained a source of disagreement among experts, researchers and professional financial analysts. According to evidences obtained from accessible literatures on the area, researchers in different countries have reported mixed findings regarding to the impact of liquidity on the profitability on banking industry. On one hand, relatively substantial amount of theoretical and empirical literatures has advocated negative relationship between liquidity and bank profitability. On the other hand, some empirical literatures have insisted positive relationship between liquidity and profitability in banking industry. Furthermore, there are still somestudies that have reported no impact of liquidity on bank profitability. Findings obtained from previous studies on the area more in general tend to suggest that researchers on the area have failed to reach a consensus regarding to impact of liquidity on bank profitability. This highlights the need to conduct further investigation on the impact of liquidity on profitability of banking industry. This study is therefore aimed to provide some insights to mixed findings reported by the previous studies regarding to empirical relationship between liquidity &bank profitability by investigating impact of liquidity on profitability of commercial banks in Ethiopia.

Literature Review

There is substantial amount of empirical works on the impact of liquidity on profitability of banking industry. According to evidences obtained from accessible literatures on the area, considerable number ofstudies have been conducted to investigate empirical relationship between liquidity and bank profitability. According to Dr. Mohamed & Adel (2020), there are many researches that haveinvestigated the relationship between bank liquidity and bank profitability. In a similar way,Obim et al. (2020) states that extensive studies have examined the impact of liquidity on the profitability of commercial banks in various countries all over the world.Evidences obtained from accessible literatures on the area suggest that variousstudies have been conducted to provide awareness regarding to the relationship between liquidity and profitability of banks. Even though extensive studies have been conducted by various researchers in different countries, noconclusive finding has been reached by previous studies on the area regarding to empirical relationship between liquidity and bank profitability.

Evidences on the area suggest that the impact of liquidity on bank profitability has remained as resolved issue in the banking literatures. As it can be evidenced from literatures on the area, previous studies have reported mixed finding regarding to empirical relationship between liquidity and bank profitability. One strand of previous studies has claimed negativerelationship between liquidity and bank profitability. In this regard, considerablenumber of theoretical and empirical literatures hasreported adverse impact of liquidity on the profitability of banking industry. For instance, Awulo et al. (2019), Mohanty and Mehrota (2018), Shafana (2015), Molyneux and Thornton (1992), Dahiat (2016), Alshatti (2015), Bolek and Wilinski (2012)&Kanaan (2002) have reported negative impact of liquidity on bank profitability.

On the other hand, some literatures on the area have reported positive impact of liquidity on the profitability of banking industry. Contrary to theoretical arguments regarding to the relationship between liquidity and bank profitability, few studies on the area have claimed positive impact of liquidity on the profitability of bank. For instance, investigation conducted by Bourke (1989), Alshatti

(2015), Ikeora and Andabai (2016), Ahmad (2016), Almazari (2014), Dr. Mohamed & Adel (2020) revealed positive relationship between liquidity and bank profitability.

Still, there are another strand of literatures that have reported no relationship between liquidity and bank profitability.According to evidences obtained from accessible literatures on the area, considerably very few literatures on area have claimed that liquidity has no impact on bank profitability. For instance, Olarewaju and Adeyemi (2015), Rehman and Khokhar (2015), Rahma and Sereen (2009)& Al Obaid and Ali (2015)reported no relationship between liquidity and profitability of banking industry.

Methodology.

This section discusses source of data,specification of empirical model& estimationtechnique employed by the study.

Source of data

To investigate the impact of liquidity on bank profitability, the study relied only on secondary data obtained from six commercial banks in Ethiopia.Secondary data contains only evidences obtained from comprehensive income statement and balance of sample of six commercial banks for sixteen years, from 2002 to 20017.Banks chosen for the for the study were those banks whose required data available for the study periods.Other banks were excluded from the study as the researcher was not able to access required data on the variables of the study during the periods under the investigation.

Specification of Empirical Model

Extensive review has been conducted on accessible literatures on the area to identify empirical model widely applied by previous researchers on the area. Evidences obtained from accessible previous studies on the area suggest that different empirical models have been employed by previous researchers on the area by using various variables to measure bank liquidity and profitability. Based on the variables and models widely used by previous studies on the area, the following empirical models have been specified for the study to investigate the impact of liquidity on bank profitability.

$$ROA\ it = \alpha_0 + \beta_1 LAR\ it + \beta_2 LDR\ it + \beta_3 CDRit + + \beta_4 DAR\ it + \mu it \text{---------- Model – I}$$

$$ROE\ it = \alpha_0 + \beta_1 LAR\ it + \beta_2 LDR\ it + \beta_3 CDRit + + \beta_4 DAR\ it + \mu it \text{---------- Model – II}$$

$$NIMR\ it = \alpha_0 + \beta_1 LAR\ it + \beta_2 LDR\ it + \beta_3\ CDR\ it + + \beta_4 DAR\ it + \mu it \text{----------Model -III}$$

Where

ROA it represents return of asset of bank i at t period.

ROE it represents return on equity of bank i at t period

NIMR it represents net interest margin ratio of bank i at t period.

LAR *it* represents liquid assets to total assets ratio of bank i at t period.

LDR *it* represents liquid assets to demand deposits ratio of bank i at t period

CDRit represents credit to deposits ratio of bank i at t period.

DAR *it* represents deposits to total assets ratio of bank i at t period.

μit represents error terms

Estimation techniques

To examine the impact of liquidity on bank profitability, substantial number of previous studies on the area has applied various estimation technique. According to evidenced obtained from literatures

on the area, pooled regression, generalized least squares, fixed effect regression, random effect regression & auto regressive distribution lag model have been applied as estimation techniques by previous studies the area. Evidences obtained from accessible literatures on the area tend to suggest that pooled regression has been widely applied by considerable number of researchers on the area and generalized least squares, fixed effect regression, random effect regression & auto regressive distribution lag model have not been widely applied previous researchers. Evidences obtained from extensive review of accessible literatures on the area suggest that only very few researchershave tried to apply fixed effect and random effect separately as estimationtechniquesto examine the impact of liquidity on profitability of banking industry.To investigate the impact of liquidity on the profitability of banks under the investigation, this study applied both fixed effect and random effect panel regression techniques.

Discussion of Findings

This section discusses finding obtained from unit root test, correlation test and panel regression analysis. To test whether time series used in study is stationary or nonstationary, augmented dickey fuller test was conducted by using LevinLin–hu, Hamis-Travalis, Breitung,Im-pesaran-shin &Hadri LM stationarity testing method. After conducting stationarity test, correlation analysis was conducted to measure the strength of association and direction of the relationship independent variables used in the study by using Pearson correlation coefficient.Thissection ends up upon discussing findings obtained from panelregression analysis using fixed effect and random panel regression method.

Unit Root Test

Before conducting panel regression analysis, it is necessary to test stationarity of panel data included in the study. To test stationarity of panel data included in the study, unit root test was conducted by applying LevinLin–hu stationarity testing method & its result is presented in the following table.

Table- 1A stationarity test

Variable	Ho: Panel data contain unit root Ha: panels are stationary		P- value	Decision
	statistics			
	un adjusted t	Adjusted t		
ROA	-7.4997	-3.4582	0.0003	Ho is rejected—panels are stationary
ROE	-7.0594	-2.9678	0.0015	Ho is rejected—panels are stationary
NIMR	-4.4979	-2.5320	0.0057	Ho is rejected—panels are stationary
LAR	-3.1595	-0.3440	0.3654	Ho is accepted- panel data contain unit root
LDR	-3.4152	-0.7690	0.2209	Ho is accepted- panel data contain unit root
CDR	-5.2256	-2.5615	0.0052	Ho is rejected—panels are stationary
DAR	-5.9697	-3.5306	0.0002	Ho is rejected—panels are stationary

The above table shows stationarity test results obtained using LevinLin–hu stationarity testing method. As it can be evidenced from the p-value of LevinLin–hu stationarity testing method, panel data distribution of ROA, ROE, NIMR, CDR & DAR fulfils stationarity requirement of panel data.On the other hand, unit root test results presented in the above table shows that panel data distribution of LAR & LDR are not stationary. Existence of unit root in the data distribution of LAR & LDR suggests that it necessary to detect unit root in the data distribution of these variables. Before detecting unit root in the data distribution of LAR & CDR reported by LevinLin–hu stationarity testing method, it is

necessary confirm unit root indicated by LevinLin–hu method by using other stationarity testing methods. Accordingly, Hamis-Travalis, BreitungIm-pesaran-shin & Fisher-type stationarity testing methodwas conducted and results obtained from each method is presented in the following table.

Ho: Panel data contain unit root **Ha: panels are stationary**							
Unit root testing methods							
Variable	Hamis-Travalis method	Breitung method	Im-pesaran-shin method	Fisher-type method			
				Inverse chi squared	Inverse normal	Inverse logit	Modified Inv.Chi squared
	P - value	p- value	p- value	p- value	p-value	p- value	p- value
LAR	0.4653	0.0725	0.9285	0.9814	0.9669	0.9531	0.9464
LDR	0.4638	0.1793	0.8807	0.9721	0.9433	0.9253	0.9366

Table –2B Stationarity test

Unit root test results presented in the table-2B confirms existence of unit root indicated by LevinLin–hu method in the panel data distribution of LAR & LDR. As it can be evidenced from p- value of each method, panel data distribution of LAR & LDR are not stationary. Existence of unit problem in the data distribution of LAR &LDR suggests that these variables will give us spurious regression results if used in regression analysis without detecting unit root problem in the data distribution of each variable. Before detecting unit root in the data distribution of each variable, the researcherbelieves that is very important to further test unit root problem of these variables byapplyingHadri LM stationarity testing method and stationarity test results obtained by applying Hadri LMmethod is presented in the following table.

Table- 3C stationarity test

Ho: All panels are stationary **Ha: some panels contain unit root**			
Variable	**Statistics**	**P- Value**	**Decision**
LAR	0.0090	0.0000	Rejection of Ho hypothesis- LAR has unit root problem
LDR	10.0311	0.0000	Rejection of Ho hypothesis- LDR has unit root problem

Unit root test results obtained from Hadri LM stationarity testing method also suggest lack of stationarity in the data distribution of LAR & LDR. As can be evidenced from Table-3C, all stationarity testing methods show existence of unit root in the panel data distribution LAR & LDR. The unit root test result indicated by Hadri LM stationarity testing method suggests that it necessary to detect non stationarity in the data distribution of these variables before using them in the regression analysis or excluding them from regression analysis.Considering number of independent variables of the study and importance of each variable in examining liquidity on profitability of banks under the investigation, the researcher prefers to detect unit root problem in the data distribution of each variable ratherthan excluding them from regression analysis.To detect unit root in the data

distribution of these variables, first difference was computed for each variable. After detecting non stationarity through first differencing, unit root testing was again conducted by LevinLin–hu method and its result is presented in the following table.

Tabe 4D: stationarity test

Variable	Ho: Panel data contain unit root Ha: panels are stationary		P- value	Decision
	statistics			
	un adjusted t	Adjusted t		
LAR	-7.0888	-4.0159	0.0000	Ho is rejected—panels are stationary
LDR	-7.5731	-4.5105	0.0000	Ho is rejected—panels are stationary

Unit root test results obtained using LevinLin–hu method show that data distribution of variable LAR & LDR became stationary after computing first difference for each variable.

Correlation Analysis

Correlation analysis was conducted to test existence of multicollinearity among independent variables of the study and to measure association and direction of the relationship among independent variables used in the study. Correlation test results obtained byusing Pearson correlation coefficientis present in the following table.

Table- 5ACorrelation test

	LAR	LDR	CAR	DAR
LAR	1.0000			
LDR	0.9746	1.0000		
CDR	-0.0255	-0.0288	1.0000	
DAR	0.1402	0.1179	-0.0949	1.0000

Person correlation matrix presented in the table-5A shows that there is no multicollinearity problem among independent variables except correlation between LDR & LAR. As it can be seen from table-5Acorrelation statistics, LAR is almost perfect linear function of LDR. Existence of almost perfect positive correlation between LAR & LDR would affect regression output by undermining statistical significance of these variables on dependent variablesif they are used in the regression analysis without perfecting correlation problem.So, it is necessary to detect existence of multicollinearityproblem between LAR & LDR before using these variables in the regression analysis.

To detect existence of almost perfect linear correlation between LAR & LDR, second difference was computed for LAR as first difference wasalready computed to detect unit root problem as discussed under unit root test section and correlation output after computing second difference for LAR is presented in the following table. As it can be seen from table-5B, there is no severe multicollinearity problem among independent variables of the study after detecting multicollinearity problem between variable LAR & LDR.

Table- 5B Correlation test

	LAR	LDR	CAR	DAR
LAR	1.0000			
LDR	0.6146	1.0000		
CDR	0.1204	0.0533	1.0000	
DAR	0.0319	0.0795	-0.0461	1.0000

Regression Analysis

This section discusses results obtained from regression analysis. To examine the impact of liquidity on the profitability of banks under the investigation, panel data regression was conducted by using fixed effect and random effect and regression outputs obtained from both methods are presented in the following table.

Test 6- Regression results

Random effect method							**Fixed effect method**					
Model – I			**Model-II**		**Model- III**		**Model - I**		**Model- II**		**Model -III**	
Variable	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
LAR	.007	0.433	.069	0.640	-.039	0.864	.008	0.389	.063	0.618	-.110	0.582
LDR	-.015	0.132	-.116	0.476	.314	0.210	-.016	0.107	-.104	0.455	.416	0.063
CDR	.007	0.371	-.209	0.045	0.286	0.074	.004	0.621	.155	0.173	0.306	0.091
DAR	-0.004	0.687	.073	0.624	-.127	0.578	-.0009	0.923	.140	0.295	-.179	0.396
Cons.	2.79	0.001	35.09	0.009	4.10	0.843	2.73	0.003	7.53	0.547	7.11	0.720

As it can be seen from regression output presented in the table-6, liquid asset to asset ratio (LAR) has positive impact on return on asset (ROA)both under random effect and fixed effect estimation technique. As it can be evidence from regression output presented from table-6, one percent increases in liquid asset to asset ratio contributed about 0.007%& 0.008%risesin return on asset (ROA) both under random effect and fixed effect respectively. The finding suggests that increases in liquid asset to asset ratio has positive impact of the profitability of banking industry.

In a similar way, liquid asset to asset ratio (LAR) was found to have positive impact on return on equity (ROE) both under random effect and random effect estimation techniques.

Beta coefficient of LAR presented in the table-6 shows that about 0.069%&0.063% rises inROE was observed under random effect and fixed effect estimation techniques respectively as a result about 1% increases in the liquid asset to asset ratio of banks under the investigation during study period.Regression outputs presented in the table-6also shows that liquid asset to asset ratio is found to have a negative impact of net interest margin ratio (NIMR). As it can be seen beta coefficient of LAR of the model-III, about 1% increases in liquid asset to asset ratio contributed to about 0.039% &0.110% decline in net interest margin ratio under random effect and fixed effect respectively.

Regression output presented in the table-6 showsexistence of negative relationship between liquid asset to deposit ratio (LDR) and return on asset both under random effect and fixed effect estimation techniques. The result suggest that as result of 1% increases in liquid asset to deposit ratio, about 0.015% &0.016% decline in return on asset was observed under random effect and fixed effect respectively. In a similar way, LDR was found to have a negative impact of return on equity (ROE) according to estimation made by using random effect and fixed effect regression model. As beta coefficient of LDR of model- II shows, about 1% increases in LDR led to 0.116% & 0.104% decline in ROE both under random and fixed effect respectively during the period under the investigation.

Finding obtained on the impact of liquid asset to deposit ratio (LDR) on the net interest margin ratio (NIMR) revealed positive impact of LDRon NIMR during study periods. According to estimation obtained by using random effect and fixed effect panel regression, there is a positive relationship between liquid asset to deposit ratio and net interest margin ratio. As it can be seen from beta coefficient of LDR, about 0.314% &0.416% increase in net interest margin ratio was observed both under random effect and fixed respectively as a result of 1% increases in liquid asset to deposit ratio

of banks under the investigation during the study period. Finding of the study on the effect of credit to deposit ratio (CDR) on return on asset (ROA) by applying random and fixed effect estimation revealed positive relationship between CDR and ROA.The finding suggests that profitability of a bank increases when credit to deposit ratio increases by assuming that other things being constant. The beta value of CDR shows that about 0.007% & 0.004% change(increase) in ROA both under random and fixed effect estimation techniques respectively as a result of 1% increases in CDR.

On the other hand, finding on the impact of credit to deposit ratio (CDR) on return on equity (ROE) revealed adverse impact of CDR on ROE under random effect regression estimation technique and positiveimpact under fixed effect estimation technique. As it can be seen from beta value of CDR of model- II, 1% increases in CDR contributed to about 0.209 % declines in return on equity according estimation made by using random effect and 0.155% increases in return on equity according to estimation made by applying fixed effect estimation technique. Finding obtained on CDR further revealed that positive relationship between credit to deposit ratio (CDR) and on net interest margin ratio (NIMR) both under random and fixed effect panel regression analysis.As it can be seen from table-6, about 0 .286% and 0.306 % increases in net interest margin ratio (NIMR) was observed under randomeffect and fixed effect respectively as result of 1% increases in CDR.

The last part of regression output shows finding obtained on the impact of deposit to asset ratio (DAR) on return on asset (ROA), return on equity (ROE) and interest margin ratio (NIMR) respectively by applying random and fixed regression analysis. It was found that DAR has negative effect of on ROA & NIMR both under random and fixed effect. The finding suggests that about 0.004% and 0.0009% decreases in ROA& NIMRwas observed respectively as a result of 1% increases in deposit ratio according to estimation made random and fixed regression estimation respectively. In a similar way, deposit to asset ratio was found to have adverse impact of net interest margin ratio. As it can be evidenced from table-6,1% increases in DAR led to about 0.127% & 0.179% decreases in NIMR under random and fixed effect respectively. On the other hand, DAR was found to have positive impact on return on equity (ROE) according to estimation made both by using random and fixed effect panel regression estimation techniques. As shown in the table-6, about 0.073% & 0.295% increases in return on equity was observed as a result of 1% increases in DAR both under random and fixed effect respectively.

Findings of the study tend tobe consistent with empirical results discussed in the literature review part. As discussed in the literature review part, significant level of inconsistency has been reported by previous empirical studies regarding to the impact of liquidity on profitability of banking industry. Empirical results discussed in the literature review suggest that no conclusive findings have been obtained by previous researchers regarding to empirical relationship between liquidity and bank profitability. As discussed in the literature review part, researchers on the area are highly divided on the impact of liquidity on the profitability of banking industry. On one hand, relatively considerable number of studies has reported negative impact of liquidity on profitability of banking industry. On the other hand, some studies have reported positive impact of liquid on profitability of banking industry. Still, there are some studies that have reported no impact of liquidity on the profitability of banking industry as stated in the literature review part.

Findings of this study are more or less similar with the findings of pervious empirical studies on the area. For instance, findings obtained on negative impact of liquidity indicators ratios on profitability indicators ratioscan be supported by the finding of Awulo et al. (2019), Mohanty and Mehrota (2018), Shafana(2015),Molyneux and Thornton (1992), Dahiat (2016), Alshatti (2015), Bolek and Wilinski

(2012), who found negative impact of liquidity on profitability of banking industry. In a similar way, findings obtained on positive impact of liquidity indicators variables on profitability indicators variables of the study can be substantiated by the finding of Bourke (1989), Alshatti (2015), Ikeora and Andabai(2016),Ahmad (2016), Almazari (2014), Dr. Mohamed & Adel (2020), who found positive impact of liquidity on profitability of banking industry. However, findings of this study contradict with the findings some empirical studies that have found no impact of liquidity on profitability of banking industry. For instance, it contradicts with the findings of Olarewaju and Adeyemi (2015), Rehman and Khokhar (2015), Rahma and Sereen (2009), Al Obaid and Ali (2015), who found no effect of liquidity on profitability of banking industry.

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