Nexus between Bank's Liquidity and Profitability in Bangladesh: An Empirical Overview

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Abstract

The main objective of the paper is to investigate the relationship between banks' liquidity and profitability and the impact of liquidity on bank's profitability. The paper applies the ordinary least square (OLS) method for the sample period from 1997 to 2014 to examine the impact of liquidity on banks' profitability. The paper finds that the advance deposit ratio positively impacts banks' profitability while profitability is defined as return on asset (ROA). Call money rates, non performing loans (NPLs), and excess liquidity impact banks' profitability in a negative fashion. The negative relationship between NPLs and ROA has been a major concern for the policymakers in the banking industry of Bangladesh since NPLs in the banking sector have increased during the last three years in the post 2011 period.

JEL Classification: G21, C32

Keywords: Liquidity, profitability, banking industry, Bangladesh economy

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1. Introduction

The tradeoff between banks' liquidity and profitability depends on the demand and supply of liquidity in the banking sector. Banks have to maintain adequate liquidity at a reasonable cost to meet the demand of funds at the time needed. When a bank's demand for liquidity is higher than the supply it either sells its liquid assets or borrows funds to meet the deficit which effects the profitability of the bank. On the other hand, when a bank's supply of liquidity exceeds its demand, it loses some earnings which also impacts its profitability. Excess liquidity indicates idle funds that do not fetch any profit. On the other hand, insufficient liquidity deteriorates bank's credit that would lead to forced liquidation of banks assets. Therefore, Bank's liquidity plays an important role in the bank's profitability. Thus, it is important to understand the relationship between liquidity and profitability in the banking sector for any country.

Maintaining adequate liquidity and earning profitability are very important tasks for the banking industry in Bangladesh. Banks earn profit for its shareholders, at the same time they maintain adequate liquidity for ensuring safety and security . Therefore, banks has to maintain a balance between liquidity and profitability. Figure-1shows that the profitability of the banking sector, as measured by return on asset (ROA), showed a mixed trend during the period from 1997 to 2005. It has a declining trend up to 2000. During 2001-2004 it showed a mixed trend and after 2005 it exhibited an upward trend and picked in the year 2010. This may be due to increased credit growth which is attributed to increase in business activities due to recovery of global financial crisis. Besides, non- performing loans were 7.1 and 6.2 in 2010 and 2011 respectively which was 34.9 percent in 2000 (Appendix, table-A4). After 2010 ROA exhibited a downward trend. BB instructed the banks to maintain their advance deposit ratio (ADR) within a certain level (for conventional banks up to 85 percent and for Islamic shariah based banks up to 90 percent) by June 2011. In addition, after 2011, non - performing loans also increased and stood at 10.8 percent in 2014. As a result, credit as well as ROA showed a downward trend.

Figure 1 demonstrates that liquidity showed a mixed trend during 1997-2009[2]. After 2009, it showed an increasing trend due to BB's measures to improve liquidity position in the banking sector. Accordingly, excess liquidity showed an upward trend during 2007-2014 (except in 2010 when the banking sector faced a liquidity crisis). From Figure -1 it seems that liquidity and profitability moved into opposite directions during the period under consideration. During 1997-2014, total liquid asset of the banking sector was on average 24.73 percent of the total assets and excess liquidity was approximately about 7.82 percent[3].

Figure 1: Trend in Liquidity and Profitability: 1997-2014
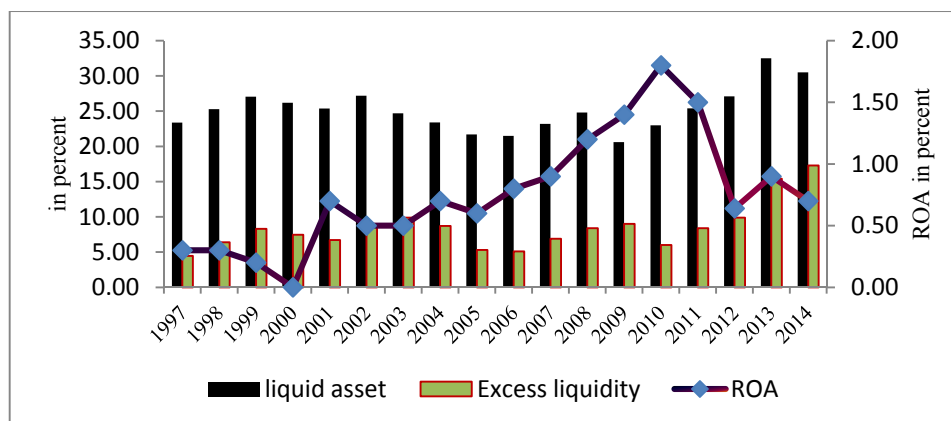
Source: Annual Reports, Bangladesh Bank (1997-2014)

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[2] Bangladesh Bank defines liquidity position of the scheduled banks as total liquidity = Cash in tills + balance with Sonali bank + balance with BB + investment in unencumbered approved securities. Excess liquidity = total liquid asset- required liquid asset (CRR +SLR).
[3] Liquid asset=percent of liquid asset in total asset. Excess liquidity=percent of excess liquidity in total liquidity.

Figure 2 shows that deposit and credit growth exhibited more or less a steady upward trend during 1997-2011. After 2011 both trends reveal downward trend. Deposit growth may be downward due to slower rates of increase in deposits from the households due to high inflationary pressure (10.62 percent). On the other hand, the dropping in credit was due to the fact that, BB instructed banks to maintain their ADR within a certain level by June 2011. Thus it is important for the policy makers to understand the relationship between liquidity and profitability in the banking sector in Bangladesh so that they can formulate the appropriate liquidity management policy for commercial banks.

Figure 2: Trend in Credit and Deposit growth: 1997-2014
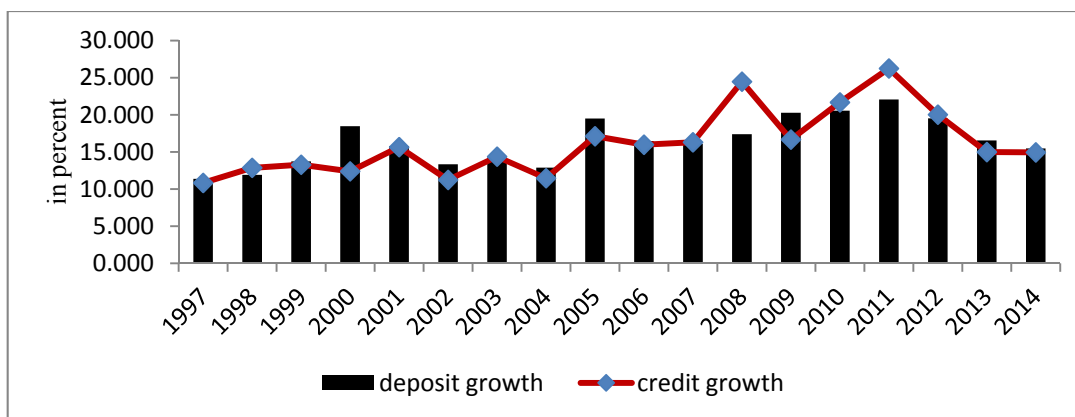
Source: Economic Trends, Bangladesh Bank (1997-2014)

Commercial banks in Bangladesh maximize their profit by managing assets and liabilities efficiently. Though banks' objective is to maximize profits, they are concerned about banks liquidity and safety. Banks earn profits for their shareholders and at the same time satisfy the withdrawal needs of its customers and meet the demand of regulatory requirement (i.e., maintain CRR and SLR set by the Bangladesh Bank). However, banks' day-to-day required liquidity can be decided within their demand-supply framework (Appendix Table-A1). Hence, it is very difficult for a bank to achieve the goal of profitability and also keep an adequate liquidity at the same time.

Against this background, the main objective of the paper is to investigate the relationship between liquidity and profitability as well as the impact of liquidity on banks' profitability of the banking industry as a whole. The paper examines the impact of liquidity on banks profitability by applying ordinary least square method (OLS). The yearly data has been used for the period from 1997 to 2014. The rationale for using this period is that after the expiry of Financial Sector Reform Project (FSRP) in 1996, the Government of Bangladesh formed the Banking Reform Committee to evaluate the situation in the banking sector. Besides, in 1997, Commercial Bank Restructuring Project (CBRP) has been undertaken to take progress on key issues and urgent actions were needed for the development of commercial banks. Meanwhile, an international standard-based audit of the loan portfolio, assets / liabilities and capital adequacy had to be formed in all banks in order to make full and proper disclosure of their financial position.

The paper finds a positive relationship between advance deposit ratio and profitability. The call money rate varies negatively with banks' profit which- indicates that banks meet their liquidity deficit with higher cost. As a results, higher cost of funds impact bank's profit inversely. Accordingly, the estimated result shows a negative relation between -NPLs and profitability, and excess liquidity and profitability. The remainder of the paper is organized as follows: following the introduction in section I, review of the literature is given in section II. Section III gives a detailed scenario of liquidity and profitability in the banking sector of Bangladesh and section IV analysis model specification, variable definition and methodology. Section V describes the estimated results . Finally, section VI gives the conclusion.

2. Review of Literature

Literature indicates that many studies have been taken on the relationship between liquidity and profitability in the banking industry. These studies show that the relationship between liquidity and profitability is not conclusive. Some papers find no significant relationship between liquidity and profitability. These include Aloy (2012) for Sri Lanka from the year 2007-2011, Junaidu et al (2014) for Nigeria for the period 2003-2012 and Afia et al (2014) for Bangladesh for the period 2006-2011". On the contrary, papers that find a positive relationship include " Wambu (2013) for Kenya during 2008-2012, Munther et al. (2013) for Jordanian for the period 2005-2011, Andrew et al (2013) for Nigeria during 2012".

Junaidu et al (2014) examine the impact of liquidity on the profitability of Nigerian banks for the period 2003-2012. They find a positive relationship between ROA and cash and bank balances to total liabilities and return on equity (ROE) and cash and bank balances to total liabilities. They also find no significant impact between liquidity and profitability among the listed banking firms in Nigeria. Wambu (2013) explores the relationship between profitability and liquidity of 44 commercial banks in Kenya during 2008-2012. He concludes that profitability and liquidity have a positive relationship and that liquidity is not a significant determinant of commercial bank's profitability but one of the determinants of it.

Aloy (2012) analyses the tradeoff between liquidity and profitability of selected 31 listed manufacturing firms for 2007-2011 in Sri Lanka. His findings suggest that there is no significant relationship between liquidity and profitability among the listed manufacturing firms in Sri Lanka. Munther et al. (2013) investigate the impact of liquidity on Jordanian banks profitability through return on assets for the period 2005-2011. Their study revealed that there is significant impact of quick ratio on ROA at 5 percent level of significant. Andrew et al. (2013) examine the efficacy of liquidity management and banking performance in Nigeria. The research was survey based for the year 2012. They find that there is a significant relationship between efficient liquidity management and banking performance and that efficient liquidity management enhances the soundness of banks.

Afia et al. (2014) examine the liquidity-profitability relationships for the banking industry of Bangladesh by using yearly data from 2006-2011. They also find no significant relationship between liquidity and profitability in this industry (government bank, Islamic bank, private commercial bank, and multinational bank). They use only two variable liquidity (current ratio) and profitability (ROA), therefore their results suffer from omitted variable bias.

The above mentioned studies explain the relationship between liquidity and profitability in the banking sector in different countries. Most of these papers use only two variables, but there are numerous variables (bank specific and macroeconomic) that can influence the relationship. However, there is a dearth of studies examining the this issue in the context of Bangladesh. To fill this gap I have undertaken this empirical study. In Bangladesh the recent financial scam (Hall Mark and BASIC Bank) and huge loan default examples erodes the asset quality which impact on profit earnings of the banking sector**.** Besides, it not only impacts profit earnings but also banking sectors resilience and stability. Maintaining stability and profitability of the banking sector are now the major concern for the policy makers. I think that the findings of the paper gives some thought to the policy maker.

3. Liquidity and Profitability Scenario in the Banking Sector in Bangladesh

  Liquidity

Maintaining a sound liquidity position is one of the significant indicators of a bank's performance. Without ensuring adequate liquidity the banking sector will fail to mobilize its resources for earnings profit.

The ADR is one of the most useful indicators of adequacy of banks' liquidity[4]. The higher ratio of ADR indicates a stress in the banking system and a low level of liquidity to respond to shocks (Evans et al. 2000). The lower ratio of ADR, on the other hand, indicates an increasing ability of the banking system to mobilize deposits to meet credit demand. Banks may earn higher profit by increasing the ADR although it indicates lower liquidity. Bangladesh Bank (BB) is currently measuring the ADR ratio as a gross measure to calculate the liquidity condition prevailing in the banking sector.

During 1997-2014, the ADR showed a mixed trend. The ratio was above 84 percent during 1997-1999. Afterwards, it showed a downward trend till 2009 and again it increased during the 2010-2012 (Figure 3). The higher growth in advances may be attributed to increase in business activities due to recovery from the global financial crisis. The interbank money market faced liquidity stress at the end of 2010 and it continued throughout the year 2011, which was due to high government borrowings and slower rates of increase in savings from the households due to high inflationary pressure. However, activities quickly turned to a business-as-usual situation with supportive measures taken by the BB and prudent policies of the financial institutions. The ADR started declining from 81.1 percent in January, 2012 to 73.18 percent in December 2013 and reached 72.54 percent in 2014.

The overall ADR also influenced by the government borrowing from banking system . Government borrowing from the banking system would create an extra burden to the banking sector by creating liquidity shortage. It is envisaged from Figure 3 that government borrowing from the banking system started to increase from 2008 (except 2010 due to prevailing liquidity crisis in the banking sector) and after 2010, it increased significantly. Consequently there was huge liquidity crisis in the banking sector. A rising trend of credit to the Government by the banking system may create strain on the lending capacity of scheduled banks.

An increase in central bank credit to banks and other financial institutions often reflects liquidity situation in the financial system (Evans et al. 2000). It is observed that banks (DMBs) borrowing from BB showed a mixed trend during 1997-2014. An increasing trend was exhibited from 1997 to 2006. It declined from 2007 and started to increase significantly in 2011 and 2012, which indicates a liquidity crisis in the banking sector. It decreased substantially in 2013 and 2014 (Figure 3).

Figure 3: Trend in Liquidity Indicator in the Banking System: 1997-2014
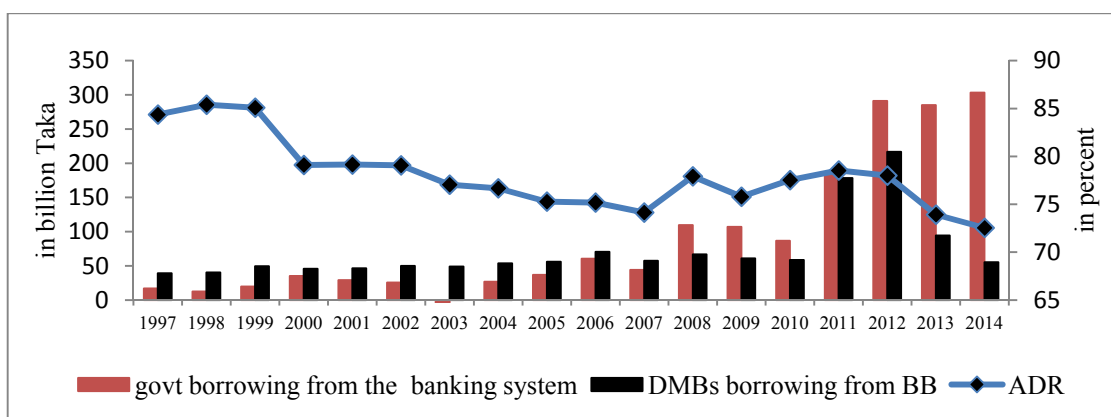
Source: Annual Report, Economic Trends of Bangladesh Bank, and Bangladesh Economic Review, Ministry of Finance (1997-2014).

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[4] Deposits are the main sources of funding for the banking sector in Bangladesh in addition to the capital, reserves and borrowings. Banks mainly use their funds to provide loans and invest in debt securities. The ADR, is, therefore, a useful indicator of banks' liquidity in Bangladesh.

Interbank money market is an important indicator for evaluating the liquidity position in the banking sector. It is observed that investment in call money market decreased by 11.61 percent while, borrowings increased by 30.96 percent in 2010 from its previous year (Table-1). It may be mentioned that the interbank money market faced some liquidity stress at the end of 2010. BB's instruction to increase the Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR) in December 2010, along with rising import payments and diversion of cash to the stock market, created some temporary pressures in the interbank liquidity market. However, investment in call money market increased dramatically by 191.5 percent while, borrowings from call money market increased by only 41.5 percent in 2011 compared to that of 2010.

The call money rates declined from the early part of 2013 until June 2013, after which it increased slightly and fluctuated marginally during the rest of the year. This dip in the call money rates and reduced amount of call money borrowings indicated that the banks were able to ease down from their earlier condition of liquidity stress. In 2013, call money borrowing also decreased substantially and slightly increased in 2014. The reduction in call money borrowing and investment and a stable call money rates within the lower ranges indicated that the banks were able to ease down from their earlier condition of liquidity stress (Table-1).

Another very important market to assess the liquidity scenario is the interbank repo market. The interbank repo rates more accurately indicates the money market conditions, because the rates are determined based on the demand and supply orientations in the money market. From 2011 the volume and rates for repo increased substantially which also indicates liquidity stress. In 2013 the repo turnover decreased, and then increased a little during the latter half of the year, but the repo rates decreased continuously which again suggest adequate liquidity in the banking system. The relatively higher turnover might be due to fund management strategies of the banks. The prevailing very low ADR, decreasing call money rates and repo rates indicate that the banking industry is currently having substantial liquidity.

Table-1: Trends in the interbank money market developments

	CY09	CY10	CY11	CY12	CY13	CY14
Borrowings (in billion Taka)	121.98	159.75	226.2	316.0	221.6	244.9
Investment (in billion taka)	49.70	43.93	128.1	66.8	46.5	63.32
Call money rate	4.39	8.06	11.16	12.82	7.78	7.93
Repo rate	4.5	5.5	7.25	7.75	7.25	7.36

Note: CY= calendar year, Source: Financial Stability Report various volumes (2010-2015), Bangladesh Bank.

Profitability

Profitability is a measure by which banks' revenues exceed its relevant expenses (Niresh, 2012). Strong earnings and profitability profile of a bank reflect its ability to support present and future sound operation, absorb future contingent shocks and strengthen resilience capacity. A low profit would suggest ineffective management and investors would be hesitant to invest in the bank. Although there are various indicators of earnings and profitability, the most representative and widely used indicator is the return on assets (ROA), which is supplemented by return on equity (ROE) and net interest margin (NIM). ROA is primarily an indicators of managerial efficiency and it indicates how capable the management of the banks has been converting the institution's asset into net earnings. ROE measures the rate of return flowing to the bank's shareholder. The NIM measures how large a spread between interest revenues and interest costs management able to achieve by close control over the bank's earning assets and the pursuit of the cheapest sources of funding.

ROA in the banking industry increased gradually to 1.80 percent in 2010 from 0.70 percent in 2001. Afterwards, it declined to 0.6 percent in 2012. An analysis of the indicator reveals that the ROA of the state owned commercial bank (SCBs) was less than banking industry average. During 2008-2011, it showed an increasing trend, but it declined to -0.6 percent in 2012 due to financial scam and a huge default loan which incurred a big net loss. In 2013 the ROA of SCBs increased and became positive at 0.60. The DFIs situation is not better due to persistent operating losses incurred by Bangladesh Krishi Bank (BKB) and Rajshai Krishi Unnayan Bank (RAKUB). The ROA of DFIs deteriorated (0.4 percent) in 2013. The ROA of the PCBs showed a consistently strong position until 2010, but it slightly dropped in 2011 and 2012 due to a decrease of net profit during the period. In 2013, it didn't drop from the previous year. Though ROA of foreign banks (FCBs') has been consistently strong during the last couple of years, it decreased slightly in 2013 and again increased in 2014 (Table-2).

Table-2:   Trend in Return on Assets (ROA) by Types of Banks

Year/Bank Type	SCBs	DFIs	PCBs	FCBs	Total
1997	0.00	-2.10	1.10	4.80	0.30
1998	0.00	-2.80	1.20	4.70	0.30
1999	0.00	-1.60	0.80	3.50	0.20
2000	0.10	-3.70	0.80	2.70	0.00
2001	0.10	0.70	1.10	2.80	0.70
2002	0.10	0.30	0.80	2.40	0.50
2003	0.10	0.00	0.70	2.60	0.50
2004	-0.10	-0.20	1.20	3.20	0.70
2005	-0.10	-0.10	1.10	3.10	0.60
2006*	0.00	-0.20	1.10	2.20	0.80
2007*	0.00	-0.30	1.30	3.10	0.90
2008	0.70	-0.60	1.40	2.90	1.20
2009	1.00	0.40	1.60	3.20	1.40
2010	1.10	0.20	2.10	2.90	1.80
2011	1.30	0.10	1.60	3.20	1.50
2012	-0.60	0.10	0.90	3.30	0.60
2013	0.60	-0.40	1.0	3.0	0.90
2014	-0.55	-0.68	0.99	3.38	0.60

 * Due to provision shortfall NIAPT (net income after provision and taxes) of 4 SCBs are administratively set at zero. Therefore, ROA for the 4 SCBs are zero. Source: Annual Reports and Bangladesh Bank Quarterly (1997-2014) of Bangladesh Bank.

Aggregate net interest income (difference between interest payments the bank receives on loans outstanding and interest payments the bank makes to customers on their deposits) of the industry has increased constantly from Taka 6.3 billion in1997 to Taka 153.8 billion in 2012. In 2013, net interest income (NII) fell down to Taka 132.3 billion reflecting mainly in the negative NII of Taka 5.4 billion by the SCBs (Table -3). The NII of the SCBs was a negative amount of Taka 1.2 billion in 2000 and it turned to positive Taka 7.7 billion in 2005. In 2001, the NII of SCBs was Taka 14.9 billion. Since 2005, SCBs have been able to increase their net interest income (NII) by reducing their cost of fund up to 2011. In 2012, the NII of SCBs dropped and in 2013 it was negative due to high interest expenses which grew faster than interest earnings. In 2014, NII of SCBs stood at 39.7 billion Taka. This increase in NII was mainly due

to investment income is taken into account in the interest income and BASIC bank and BDBL included in SCBs. The DFIs had a positive trend since 2000 and it was Taka 4.7 billion in 2012 but afterwards it showed a decreasing trend. The NII of the PCBs has been incredibly high over the period from 2003 through 2013. The trend of NII indicates that the interest spread of PCBs and FCBs is higher (Appendix Table-A2) than that of SCBs and DFIs (Bangladesh Bank Annual Report **).**

Table -3 Net Interest Income (NII) by type of Banks   (in billion Taka)

YEAR	SCBs	DFIs	PCBs	FCBs	TOTAL
1997	2.7	-0.1	1.7	2	6.3
1998	2.2	0.5	2.3	2.2	7.1
1999	3.1	-0.1	3	1.8	7.8
2000	-1.2	1	6.1	2.5	8.4
2001	-1.8	2.7	9.2	3.3	13.4
2002	-1.5	1.4	10.2	3.4	13.5
2003	-0.3	1.3	12	3.6	16.6
2004	-1.1	1.8	13.7	4.2	18.3
2005	7.7	1.0	21	5.6	35.3
2006	9	1.7	25.4	8.2	44.3
2007	7.4	1.4	36.1	9.9	54.8
2008	7.9	1.9	48.5	12.6	70.9
2009	12.1	1.9	56.7	10.7	81.5
2010	19.8	6.2	82.8	13.0	121.9
2011	34.3	4.9	91.4	16.1	146.7
2012	14.9	4.7	114.7	19.6	153.8
2013	-5.4	3.8	118.2	15.8	132.3
2014	39.7	2.1	205.8	26.6	274.0

Source: Annual Reports (1997-2014), Bangladesh Bank.

Commercial banks in Bangladesh continuously monitor their balance sheet (assets and liabilities) for balancing liquidity and risk to maximize their profitability. Banking sector aggregate balance sheet data are given in Appendix Table-A3.

4. Model Specification Variable Definition and Methodology

a. Model Specification

Since the paper examines the impact of liquidity on profitability of the banking sector in Bangladesh, we employ the following empirical model:

$$\gamma_t = \beta_0 + \beta_i\ X i_{t+}\ \varepsilon i_t \tag{1}$$

Where γ_t denotes profitability (return on asset) of bank, Xi includes a set of bank specific control variables (advanced deposit ratio, excess liquidity ratio, lending rates, non performing loans, call money

rates). Xi also include some macroeconomic variables (inflation, GDP) those are also concern for banks liquidity as well as profitability. β_i is the parameters which to be estimated. β_0 is the intercept and ε_i is the error term. We use aggregate banking industry's data.

b. Variable Definition

Return on Asset (ROA): ROA is net income after taxes/total asset. It indicates how efficiently the management of the bank has been converting its assets into net earnings.

Advanced Deposit Ratio (ADR): ADR is the ratio of total advance to total deposits. The relationship between advances deposit ratio and profitability is expected to be positive.

Lending Rates **:** Weighted average lending rates in the banking system are taken for analysis. The relationship between profitability and the lending interest rate may be positive or negative.

Call Money Rates: Interbank investment/borrowing rate indicates liquidity situation in the overall banking system. The relationship between call money rate and profitability may be positive or negative.

Excess Liquidity Ratio: Percent of excess liquidity in total liquidity. It is expected have a negative relationship with profitability.

Non Performing Loans (NPLs): gross NPLs to total loan. High NPLs signify high non-earnings asset which expected to be negative relationship with profitability.

Liquidity Deposit Ratio: Ratio of total liquidity to total deposit. It is expected to be negative relationship with profitability**.**

Inflation: Expected to be negative relationship with profitability.

 GDP growth : Expected to be positive relationship with profitability.

c. Data and Methodology

 To verify the impact of liquidity on profitability of the banking sector in Bangladesh, the paper uses the ordinary least square estimation method (OLS). The study takes secondary data for the period 1997-2014. The yearly data have been collected from (1) Monthly Economic Trend, Bangladesh Bank, (2) Annual Report Bangladesh Bank, (3) Bangladesh Bank Quarterly, Bangladesh Bank, (4) Financial Stability Report, Bangladesh Bank (5) Bangladesh Economic Review, Ministry of Finance.

5. Analysis of the Estimated Results

 Table-4 represent the descriptive statistic of the all variables. The mean of all variables which indicate a historical trend value during the period 1997-2014, are realistic. Standard deviations, measures the volatility, showed a variation during the period 1997-2014. It is observed that mean and standard deviation for NPLs are 19.81 and 12.37 respectively, which appear to be more volatile than other variables. A high mean value and volatility of NPLs raises portfolio risk and erodes capital base of the banks, which affects banks profitability. Volatility is also observed in advance deposit ratio and excess liquidity ratio during 1997-2014, which also related with banks profitability.

Table-4: Descriptive statistics of all variables

Variable	Mean	S. D
Advance Deposit Ratio	78.04	3.71
Call money Rate	8.52	2.32
Excess liquidity Ratio	7.82	3.29
Liquidity Deposit Ratio	19.52	5.71
GDP	5.81	0.61
Inflation	6.5	2.45
Lending rate	12.80	1.08
Non Performing Loans	19.81	12.37
Return on Asset	0.74	0.46

Source: Annual Reports and Economic Trends of Bangladesh Bank
(1997-2014). Authors' calculation.

Plots of the variables (Figure 4) show that all variables are stationary at level.

Figure 4 Plots of the variables used in OLS
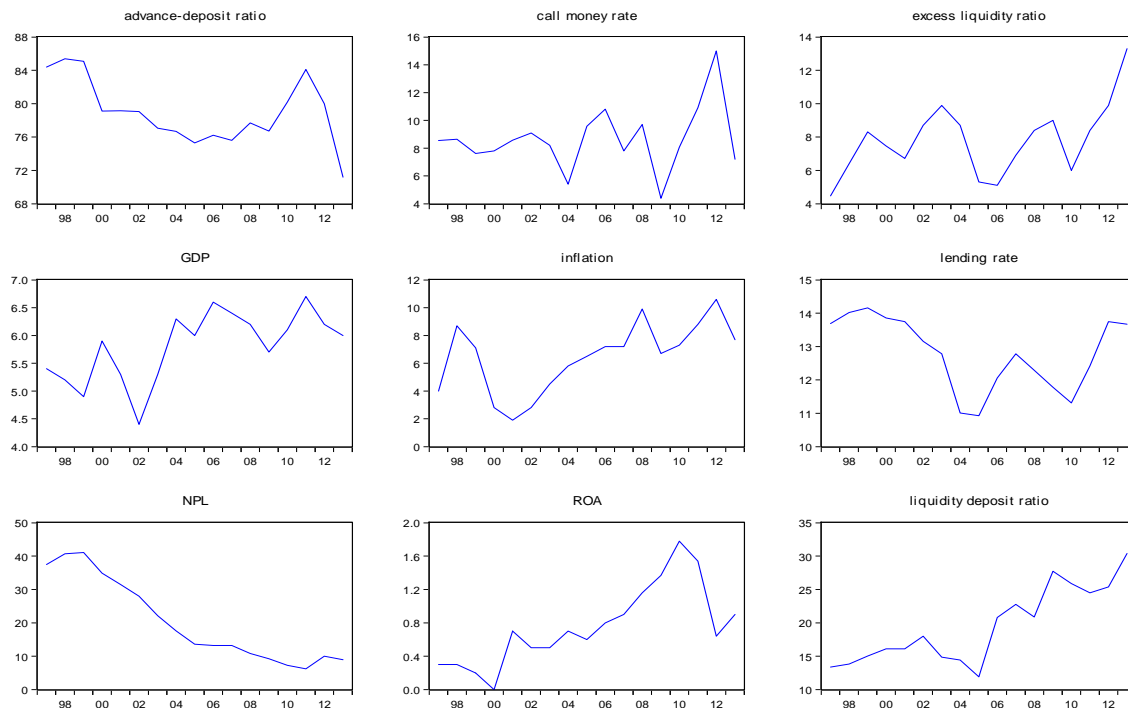
Source: Economic Trends and Annual Reports of Bangladesh Bank (1997-2014).

To test whether the variable used in the model is stationary or non-stationary, I used the Augmented Dickey-Fuller Test (ADF) and Phillips Perron (PP) tests. Both tests show that all variables are stationary i.e., I(0) at level .

Table-5 : Phillips Perron unit root tests

Variable	Model A		Model B	
	Test statistics*	Decision	Test statistics*	Decision
Advance deposit Ratio	4.47	I(0)	4.38	I(0)
Inflation	4.56	I(0)	4.41	I(0)
GDP	4.97	I(0)	4.91	I(0)
NPLs	4.75	I(0)	5.00	I(0)
Call money rate	4.46	I(0)	4.09	I(0)
Lending rate	3.63	I(0)	3.87	I(0)
Excess liquidity ratio	5.23	I(0)	5.12	I(0)
Liquidity deposit ratio	4.80	I(0)	4.80	I(0)
Return on asset	4.32	I(0)	4.35	I(0)

Note: * significant at 5 percent level. Model A includes intercept and Model B includes both intercept and trend. Source: Economic Trends and Annual Report of Bangladesh Bank (1997-2014).

Table-6 gives a picture of the correlation between explained and explanatory variables. The table exhibits that correlation of ROA with GDP, lending rates, liquidity deposit ratio and NPLs is significant. The significant and negative correlation between ROA and NPLs implies that high NPLs decrease ROA. The estimated result also shows that correlation between lending rates and ROA is -0.59 which indicates that prevailing high lending rate distress ROA due lower credit demand. An estimated result of correlation coefficient between ROA and GDP is 0.51 which indicates that GDP positively impact on banks profitability.

Table-6: Estimate result of correlation among ROA and bank specific and macro economic variables

	Variable	Correlation	t-Statistic
ROA	Advance deposit Ratio	-0.42	-1.86
ROA	Call money rate	-0.01	-0.07
ROA	Excess liquidity ratio	0.02	0.08
ROA	Liquidity deposit ratio	0.70	3.87
ROA	GDP	0.51	2.37
ROA	Inflation	0.41	1.83
ROA	Lending rate	-0.59	-2.94
ROA	NPLs	-0.78	-4.98

Source: Annual Report and Economic Trends of Bangladesh Bank (1997-2014). Authors' calculation.

Table-7 reveals the empirical evidence regarding the impact of liquidity on banking sector profitability. I estimate six models for the period 1997-2014 by applying ordinary least squire method (OLS). In model-1, the explanatory variables are ADR , GDP and inflation. The result of model-1 reveals that ROA elasticity with respect to all variables are statistically insignificant impels that GDP, inflation and ADR do not influence banks profitability . In model-2 when we add NPLs, the estimated result show that the banking sector profitability is affected by the advance deposit ratio and NPLs. It indicates that NPLs and ADR more sensitive to banks profitability rather than macroeconomic variables.

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Then we add call money rates, lending rates, excess liquidity ratio, liquidity deposit ratio in model-3-6 respectively. Estimated results show that the banking sector profitability is affected by advance deposit ratio, excess liquidity ratio and call money rates. The coefficients of call money rates, advance deposit ratio and excess liquidity ratio are statistically significant with expected sign. On the other hand, the lending rate and liquidity deposit ratio are statistically insignificant.

Table-7 Results of the regression model: dependent variable ROA

variable	coefficient					
	Model-1	**Model-2**	**Model-3**	**Model-4**	**Model-5**	**Model-6**
C	2.03	-6.96	-8.12	-8.65	-6.49	-5.86
	(0.55)	(-2.79)	(-3.65)	(-3.09)	(-2.55)	(-2.15)
Advance Deposit Ratio	-0.033	**0.12**	**0.14**	**0.14**	**0.11**	**0.11**
	(-0.94)	**(3.81)**	**(4.87)**	**(4.54)**	**(3.72)**	**(3.41)**
Inflation	0.050	**-0.07**	**-0.06**	**0.07**	-0.04	-0.04
	(0.993)	**(-2.19)**	**(-2.24)**	**(-2.14)**	(-1.40)	(-1.39)
GDP	-0.165	-0.02	-0.00	-0.02	-0.09	-0.09
	(0.667)	(-0.18)	(0.06)	(0.13)	(-0.82)	(-0.71)
NPLs		**-0.07**	**-0.07**	**-0.07**	**-0.08**	**-0.07**
		(-5.91)	**(-7.11)**	**(-5.95)**	**(-7.39)**	**(-3.55)**
Call money rate			**-0.05**	**-0.06**	**-0.09**	**-0.09**
			(-2.31)	**(-2.20)**	**(-3.45)**	**(-2.05)**
Lending rate				0.02	0.16	0.08
				(0.34)	(1.93)	(0.61)
Excess liquidity Ratio					**-0.06**	**-0.06**
					(-2.31)	**(-2.23)**
Liquidity deposit ratio						0.02
						(0.75)
R^2	0.332	0.819	0.875	0.876	0.919	0.924
Adjusted R^2	0.188	0.763	0.823	0.808	0.863	0.856
F Statistic	2.32	14.71	16.81	13.00	16.30	13.71
	[0.119]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Durbin Watson	1.033	1.87	1.84	1.84	2.42	2.56

Note: Figure in parenthesis indicates t-statistic and figure in[ ] indicates probability of F statistic. Source: Annual Report and Economic Trends of Bangladesh Bank (1997-2014).

According to the estimated result in models 2- 6 the coefficient of advance deposit ratio lie between 0.11-0.14 and significant at 1% level of significant, which imply that if advance deposit ratio increase 1unit ROA increase by 0.14 unit. Estimated result, also demonstrate that in all model (2-6) the coefficient of NPLs is significant and vary between -0.07 to -0.08. That is if NPLs increases by 1unit ROA decrease by 0.08 unit. On the other hand, ROA elasticity with respect to call money rates range between -0.05 to -0.09 which indicate that if call money rates increase 1 percentage point banks' profit decrease by 0.08 unit, which implies higher call money rate indicates higher demand from interbank borrowing show a sign of lower profit as well as liquidity stress in the banking industry. The coefficient of excess liquidity ratio is -0.06 with expected sign. This denotes that if excess liquidity increase by 1 unit, profit decrease by 0.06 unit. So, there is a tradeoff between bank liquidity and profitability. Breusch-Pagan-Godfrey shows

that there is no hetroskedasticity in the residuals of all estimated equations (1-6 model). It implies that estimated results are robust.

6. Recommendations and Conclusion

The main objective of the paper is to examine the relationship between liquidity and profitability as well as the impact of liquidity on banks' profitability. The paper uses Ordinary Least Square estimation method (OLS) method for the sample period 1997-2014. The analysis of estimated results show that the high ratio of advance deposit indicates the lower liquidity and higher profit. However, a too low ADR indicates inefficiency of the banks to use the funds, or simply a lack of profitable investment opportunities. Excess liquidity ratio negatively impact on banks' profitability. The call money rates varies negatively with banks' profit which indicates that banks meet their liquidity deficit with higher cost. As a results, the higher cost of funds impact banks profit inversely. Accordingly, the estimated result shows a negative relationship between NPLs and profitability. So commercial banks need to be careful while giving loans and reduce NPLs to increase profitability.

The recent rising in NPLs is a concern for overall banking stability because high NPLs of banks' reduce loanable funds by stopping recycling and banks cannot earn profit from classified loans. Besides, banks need to put a portion of their income as loan loss reserve to make up bad debt. It is observed (Appendix Table-A4) that the percentage share of NPLs to total loans has reduced dramatically from 1997 to 2011. The gross NPLs ratio for all banks declined to 6.20 percent in 2011 from the peak 37.5 percent in 1997. The ratio again increased during the previous two years due to sharp increase in NPLs of SCBs. Based on the above analysis we can conclude that there exists a negative relationship between liquidity and profitability. So banks authority should focus more on liquidity management for the bank's profitability. Moreover, careful consideration and planning of liquidity management is needed to improve the efficiency of liquidity management.

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APPENDIX

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Table-A1 Sources of Demand and Supply for Liquidity within the Bank

Supplies of Liquid Funds Come From:	Demands for Bank Liquidity Typically Arise From:
Incoming customer deposits	Customer deposit withdrawals
Revenues from the sale of nondeposit services	Credit requests from quality loan customers
Customer loan repayments	Repayment of nondeposit borrowings
Sales of bank assets	Operating expenses and taxes incurred in producing and selling services
Borrowing from the money market	Payment of stockholder cash dividends

Source: Commercial Bank Management, Peter S. Rose, 2002.

Table-A2 Movements in Interest Rate Spread

Period	SCBs	DFIs	PCBs	FCBs
2001	6.03	5.06	7.55	8.23
2002	6.15	5.92	7.05	7.4
2003	5.77	4.71	6.55	7.32
2004	4.87	3.7	5.54	7.45
2005	5.41	3.66	5.07	7.87
2006	5.63	3.18	5.44	8.12
2007	5.95	2.95	5.7	8.83
2008	3.96	3.12	4.7	9.33
2009	3.47	2.7	5.29	9.26
2010	4.18	2.26	5.38	8.82
2011	5.01	2.16	5.37	8.89
2012	4.06	2.73	5.51	8.76
2013	3.66	3.06	5.34	8.59
2014	3.71	1.68	5.94	7.92

Source: Scheduled Banks Statistics, Statistics Department, Bangladesh Bank (2001-2014).

Table-A3 Banking sector aggregate balance sheet in Bangladesh   (in billion Tk)

Particulars					Change (%)	
	2011	**2012**	**2013**	**2014**	**2012 to 2013**	**2013 to 2014**
Property & Assets						
Cash in hand (including FC)	59.7	81.1	102.7	91.1	26.7%	-11.33%
Balance with BB & SB (including FC)	399.5	450.8	479.3	572.8	6.3%	19.5%
Balance with other banks &FIs	155.9	244.7	347.9	409.7	42.2%	17.8%
Money at call & short notice	128.1	66.8	46.5	54.2	-30.4%	16.4%
Investments Government	662.1	607.6	841.2	977.6	38.5%	16.2%
Others	131.3	505.9	730.0	855.5	44.3%	17.2%
Total Investment	793.4	1113.5	1571.2	1833.1	41.1%	16.7%
Loans & advances						
Loans, CC, OD ect.	3525.1	4098.4	4443.5	5147.2	8.4%	15.8%
Bills purchased & Disct.	267.5	288.2	276.6	245.7	-4.0%	-11.2%
Total Loans & advances	**3792.5**	**4386.7**	**4720.1**	**5392.9**	**7.6%**	**14.3**%
Fixed assets	143.7	162.1	198.2	216.7	22.3%	9.4%
Other assets	401.1	488.1	532.5	570.7	9.1%	7.2%
Non-banking assets	1.2	36.9	1.7	1.9	-95.4%	11.6%
Total Assets	**5874.9**	**7030.7**	**8000.2**	**9143.0**	**13.8%**	**14.3**%
Liabilities						
Borrowings from other banks/FIs/Agents	226.3	316.0	221.6	313.0	-29.9%	41.3%
Deposits &Other Accounts Current Deposit	992.9	989.6	1091.0	1295.3	10.3%	18.7%
Savings Deposits	933.7	972.6	1047.7	1225.6	7.7%	17.0%
Fixed/Term Deposit	2583.2	2985.6	3622.3	3931.1	21.3%	8.5%
Other Deposits	-	474.4	533.3	688.6	12.4%	29.1%
Total Deposits	**4509.8**	**5422.2**	**6294.3**	**7140.6**	**16.1%**	**13.4**%
Bill payable	65.3	76.0	68.9	87.8	-9.3%	27.5%
Other liabilities	546.4	640.6	737.2	860.2	15.1%	16.7%
Total Liabilities	**5347.8**	**6454.7**	**7321.9**	**8401.7**	**13.4%**	**14.7**%
Capital /Shareholders' equity	527.1	575.9	678.3	741.3	17.8%	9.3%
Total liabilities & Shareholders' Equity	**5874.9**	**7030.7**	**8000.2**	**9143.0**	**13.8%**	**14.3**%
Off-balance sheet items	1814.6	1871.3	2153.1	2360.95	15.1%	9.7%

Source: Financial Stability Report, BB, 2014.

Table-A4 NPLs (%) of the Banking Sector by types of Banks

Types of Banks	1997	2000	2003	2006	2009	2010	2011	2012	2013	2014
SCBs	36.57	38.56	29	22.9	21.4	15.7	11.3	23.9	19.8	22.2
DFIs	65.72	62.56	47.4	33.7	25.9	24.2	24.6	26.8	26.8	32.1
PCBs	31.42	22.01	12.4	5.5	3.9	3.2	3	4.6	4.5	5.0
FCBs	3.58	3.38	2.7	0.8	2.3	3	3	3.5	5.5	7.3
Total	37.5	34.9	22.1	13.2	9.2	7.1	6.2	10	8.9	9.7

Note: NPLs= gross non performing loans to total loans
Source: Annual Reports, Bangladesh Bank (1997-2014).