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Effect of Liquidity Management on Profitability: A Comparative Analysis between Public Sector and DSE Listed Private Sector Banks in Bangladesh

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Abstract:

This study is all about the effect of liquidity management on profitability of public and DSE listed private sector banks and compares the outcomes regarding liquidity management. In this study, is taken 18 banks of Bangladesh in total as sample (9 banks from public sector where 6 banks are state owned and 3 banks are specialized and 9 banks from private sector which are listed in DSE) and also taken five years data from 2013 to 2017 for assessing the impact of liquidity management on profitability. As there is always a trade-off between liquidity and profitability, in this study find out either this trade-off is exiting in the each of banking sector or not and also assess the efficiency of liquidity management of the banks. The liquidity condition of the banking industry of Bangladesh is also highlighted in this study where it is seen that banking industry is facing some problem regarding liquidity from the 2018. The analysis part of the study is assessed the condition of the liquidity management before 2018 and found out the relationship between liquidity and profitability of public sector and private sector banks. To assess the relationship is used some financial ratios like: liquidity management is measured by current ratio, cash-deposit ratio, credit-deposit ratio and investment-deposit ratio and profitability is measured by return on assets and return on equity. By using the descriptive statistics, find out the average, standard deviation, maximum and minimum value of each ratios. The Pearson Correlation is been used to assessed the correlation between each variable with others. The relationship between liquidity and profitability is evaluated through regression model where first consider the return on assets as dependent variable and all liquidity ratios as independent variables. Again here is assessed the relationship by taking return on equity as dependent variable. After developing the model based on regression for public sector and the DSE listed private sector banks individually, the outcomes are compared to find out the effect of liquidity management on profitability and find out the efficiency in liquidity management. It is found that the DSE listed private sector banks are more efficient in liquidity management than public sector banks in Bangladesh. Because the DSE listed private sector banks are managed their liquidity function so well that it is not affecting the profitability of DSE listed private sector banks. On the other hand, the public sector banks need to improve their performance regarding liquidity management so that they can manage liquidity and profitability at the same time and remain competitive with DSE listed private sector banks in Bangladesh.

Keywords: Liquidity Management, Profitability, Public Sector Banks, Dhaka Stock Exchange (DSE) listed Private Sector Banks, Return on Assets and Return on Equity

1. Background of the study:

The study is all about the effect of liquidity management on profitability of public sector and DSE listed private sector banks in Bangladesh and comparative analysis between them. Banks are always faced tradeoff between profitability and liquidity. If a bank keeps more amount of money for liquid purpose, it will earn lower amount of profit and vice versa. So, banks have to maintain balance between profitability and liquidity. This study is based on the effect of liquidity management on public and DSE listed private sector banks of our country and find out the efficiency of public sector and DSE listed private sector liquidity management based on comparative analysis.

2. Objectives of the study:

The objectives of the study are:

- i. To find out the return on equity (ROE) and return on assets (ROA) as indicators of profitability and calculate some ratios as indicators of liquidity management
- ii. To identify the relation between liquidity and profitability of public sector banks
- iii. To identify the relation between liquidity and profitability of DSE listed private sector banks
- iv. To conduct a comparative analysis between public sector and DSE listed private sector banks for detecting the effect of liquidity management on profitability.

3. Methodology:

3.1. Nature of the study

The study is descriptive in nature and used quantitative data. The study covers five years data of public sector and DSE listed private sector banks. This helps to find out the effect of liquidity management on profitability in descent manner.

3.2. Sources of the data

The study is based on the secondary data only. To collect the data use the website of selected public and DSE listed private sector banks for annual report of five years. The website of news portal and some articles is also been used for collecting the data.

3.3. Population size

The numbers of scheduled banks in Bangladesh has 61 according to the Bangladesh Bank. The public sector consists of six state owned banks and three specialized banks. The private sector has 33 conventional banks, 10 Islamic banks and 9 foreign banks. To find out the effect of liquidity management on profitability of public sector and DSE listed private sector banks, it is the total population size for the study.

3.4. Sample size

Here is taken nine banks from the public sector banks out of nine (including three specialized banks) and taken nine DSE listed private sector banks out of thirty three conventional banks. So, in total 18 banks are selected out of 61 banks for this study. On the other hand, five years financial data of these banks is taken for the study from the financial year 2013 to 2017.

3.5. Data analysis tools

The study is used following tool for data analysis purpose; they are:

- i. Using the descriptive statistics for finding liquidity management and profitability of public sector and DSE listed private sector banks through financial ratios by using mean and standard deviation.
- ii. To use ratio as indicators of liquidity and profitability. For measuring liquidity is used current ratio (CR), cash-deposit ratio (CDR), credit-deposit ratio (CRDR) and investment-deposit ratio (IDR). The current ratio (CR) is calculated by using formula of current assets divided by current liabilities and the others like cash-deposit ratio (CDR), credit-deposit ratio (CRDR) and investment-deposit ratio (IDR) are calculated by using formula of cash held by bank divide by aggregate deposit, outstanding credit divided by aggregate deposit and outstanding investment divided by aggregate deposit respectively. On the other hand, to assess the profitability is used the ratios, such as return on assets (ROA), return on equity (ROE). The return on assets (ROA) is calculated by using formula of net income divided by total assets and the return on equity (ROE) is calculated by sing formula of net income divided by total equity.
- iii. To find out the correlation between liquidity ratios and profitability ratio is used Pearson Correlation in this study.
- iv. To use multiple regression model to find out the relationship between liquidity management and profitability of public and DSE listed private sector banks. The regression model is used in the study is given below:

$$Y1 (ROA) = \alpha + \beta1 CR + \beta2 CDR + \beta3 CRDR + \beta4 IDR + \epsilon$$

$$Y2 (ROE) = \alpha + \beta1 CR + \beta2 CDR + \beta3 CRDR + \beta4 IDR + \epsilon$$

Where Y1 for ROA and Y2 for ROE are as dependent variables for each independent regression model and CR, CDR, CRDR and IDR are considered as independent variables for all regression models in this study. The null hypothesis (H0) for this study is there is no significant relationship between profitability of commercial banks. To test the significant of these regression model is used F-test. To carry out the F-test, Analysis of Variance (ANOVA) is conducted in this study.

These tools are used in the study for data analysis purpose and find out the effect of liquidity management on profitability of public sector and DSE listed private sector banks and conduct comparative analysis between public sector and DSE listed private sector banks based on the result of the analysis.

4. Literature Review:

A study conducted by Ali Sulieman Alshanti (2014) states that liquidity indicators (such as quick ratio, investment ratio, liquid assets ratio etc.) affect over banks' profitability that are measured by return on asset (ROA) and return on equity (ROE). The researchers recommend that there is a need for optimum utilization of liquidity in order to enhance banks' profitability. This study found that increase in quick ratio and investment ratio caused to increase in Jordanian commercial banks' profitability. On the other hand, increase in liquid assets ratio and capital ratio leads to decrease Jordanian commercial banks' profitability. So, the banks should adopt well developed framework for liquidity management to ensure adequate profit for banks and need to manage liquidity of banks in more efficient manner.

The study of Muhammad Shaukat, Mustabsar Awais and Aisha Khursheed (2016) was conducted to inspect the tradeoff between liquidity and profitability in private sector banks of Pakistan. The study revealed that there is significant relationship between bank liquidity and return on assets. So, it recommends that banks should assess and restructure their strategies for managing liquidity.

Oluwatobi Fagboyo, Anjola Adeniran and Abayomi Adedeji (2018) were published a paper to find out the impact of liquidity management on profitability within the Nigerian deposit money banks. This study found that some liquidity ratio impact positive on profitability and others have negative impact over profitability. So, the paper recommend that banks should adopt economic, effective, efficient management of liquidity with a general framework for achieving optimum result for profitability of the banks.

The study of Mathur (2002) found that private banks of India perform better than public banks of India because private sector banking has a legal support that makes them free from adversaries of extraneous pressures as well

as least involved in the socioeconomic policies of the government. The study was based on the influencing factors that cause changes the profitability of the bank including the liquidity management.

A study was conducted by Birajit Mohanty and Shweta Methrotra (2018) that is about the impact of liquidity management on profitability of public sector and private sector banks of India. The study used return on equity and return on assets as indicators of profitability and use cash deposit ratio, investment deposit ratio and credit deposit ratio for indicators for liquidity management. The study concluded that the commercial bank can focus on increasing their profitability without affecting their liquidity and vice versa.

Bordeleau and Graham (2010), using a sample of large US and Canadian banks, found that profitability generally improved for banks that held some liquid assets. However, there is a point at which holding further liquid assets reduced banks' profitability. Affiliate locations that are important for the parent bank revenue streams are relatively protected from liquidity reallocations in the organization.

Nicola Cetorelli and Linda S. Goldberge (2012) was conducted a study related to liquidity management of U.S. global banks. This paper revealed that parent banks, when hit by a funding shock, reallocate liquidity in the organization according to a locational pecking order.

Victor Curtis Lartey, Samuel Antwi and Eric Kofi Boadi (2013), using seven listed banks of Ghana out of nine banks and data for the period 2005-2010 of Ghana banks, concluded in their paper that a very weak positive relationship between the liquidity and the profitability of the listed banks in Ghana and both the liquidity and profitability of the listed banks were declining.

Sunny Obilor Ibe (2013) found that liquidity management is indeed a crucial problem on the Nigerian banking industry. The study recommend that banks should engage competent and qualified personnel in order to take right decision especially with the optimal level of liquidity and maximize profit.

Nimer et al. (2013), by using the financial reports of 15 Jordanian banks for the period of from 2005-2011, concluded that liquidity has a significant negative influence on the profitability because of banks having excessive liquidity instead of investing money to generate profit.

All the studies are about the impact of liquidity management on profitability of banks from different countries. But there is no study conducted about a comparative analysis between public sector and DSE listed private sector banks in Bangladesh based on the effects of liquidity management on profitability. So, the study is all about the effect of liquidity management on profitability of public sector and DSE listed private sector banks in Bangladesh and comparative analysis between public and DSE listed private sector banks in Bangladesh.

5. Theoretical Framework of the study:

5.1. Liquidity management

Liquidity means how quickly and easily assets or securities can be converted into cash without impacting its price or intrinsic value. Liquidity management is a concept that describe a company's ability to meet financial obligations through cash flow, funding activities and capital management. Liquidity can be managed by asset liquidity management (or asset conversion strategies, borrowed liquidity management strategies and balanced liquidity management strategies.

The asset liquidity management is a strategy of depending on liquid assets that can be readily sold for cash to meet a bank's liquidity needs. On the other hand, when a bank reliance upon borrowed funds to meet a bank's liquidity need then it is called borrowed liquidity management strategy. The combined use of liquid asset holdings (asset management) and borrowed liquidity (liability management) to meet a bank's liquidity need that is called balanced liquidity management strategy.

The liquidity position or management of liquidity of banks can be assessed by calculating liquidity ratio such as current ratio, quick ratio other ratio like cash deposit ratio, investment deposit ratio and credit deposit ratio etc. The management of liquidity is crucial for the bank as well as maintain desire amount of profit. So how well or efficient a bank perform its liquidity management function that can be measured by these ratios.

5.2. Profitability

The extent to which a business yields profit or financial gain is called profitability. It is the ability of a company to use its resources to generate revenues in excess of its expenses. The profitability ratios are a class of financial metrics that are used to assess a business's ability to generate earnings relative to its revenue, operating costs, assets and shareholders' equity over time, using data from a specific point in time.

The profitability ratios are two types. First one is margin ratios such as gross profit, operating profit, net profit and earnings before interest, taxes, depreciation and amortization. The other is return ratios such as return on assets, return on invested capital and return on equity. How well a bank performs its function and earn optimal amount of profit that can be measured by profitability ratios.

5.3. Tradeoff between liquidity and profitability

The bank has to maintain certain about of liquidity and profit at the same time. So, banks face tradeoff between liquidity and profitability because there is negative relationship between those. When a bank keep more amount of cash in hand for the liquidity purpose, then it will be left with small amount of funds for investment that generates profit for the bank. On the other hand, whenever a bank invest more money that collect as deposit from public, then it keep less amount of funds in hand as cash. In that situation, bank can face a situation where it run out of cash and unable meet to its obligation towards customers. So, liquidity management is a crucial issue to maintain a certain amount of cash in hand to meet client's obligation and at the same time invest its funds in profitable sector to generate optimal amount of profit. The banks have to generate a certain amount of profit so that it can pay dividend its shareholders in regular interval.

So, banks are always face tradeoff between liquidity and profitability. The management of banks needs to take efficient and effective policies with a general framework for the liquidity management and maintain profitability at the same time.

6. Framework of the study:

This study is all about inspecting the impact of liquidity management on profitability of public sector and DSE listed private sector banks in Bangladesh and comparative analysis between them. For that following theoretical framework is applied:

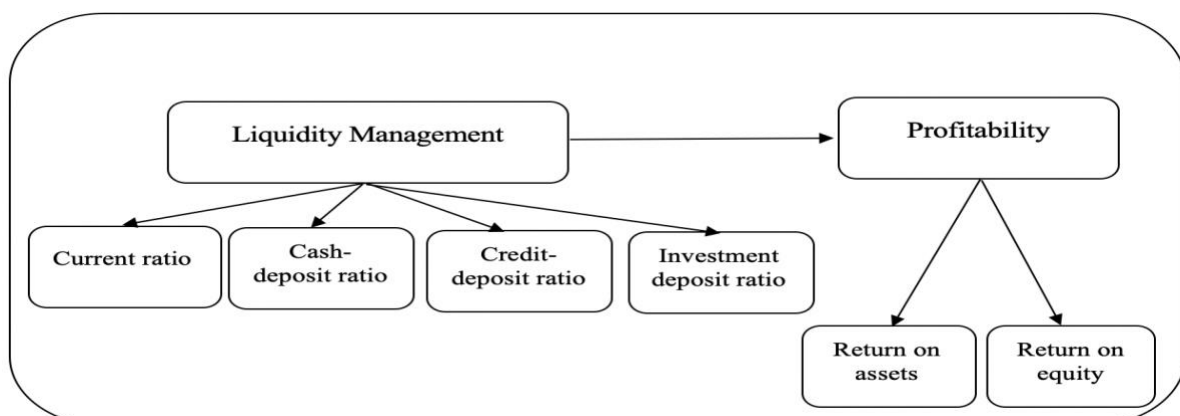


Figure 1: Theoretical Framework

So, this is the framework that is used in the study to find out the impact of liquidity management on profitability of public sector and DSE listed private sector banks in Bangladesh. To assess the liquidity management is used the ratios like current ratio, cash to deposit ratio, credit to deposit ratio and investment to deposit ratio. To assess the profitability is used return on assets and return on equity ratio. The impact of the liquidity management on profitability of the banks can be measured and analyzed by these ratios. By comparing the outcome of individual sector, it can be found out that which is more efficient than other in liquidity management and keep certain amount of profitability.

6.1. Current Liquidity Scenario of Banking Industry

At present, the liquidity position of banking industry is not satisfactory at all. Because liquidity crunch in the banking industry is continuing and the growth of deposit is lethargic at the same time. In spite of offering 11-12% interest rate to deposit in the 2019, the growth of the deposit is not up to mark. On the other hand, the recovery of loans is in question especially for the state-owned banks. The deposit growth was 10 percent in 2017 but the situation become worse day by day as around 8-9 percent growth of deposit. As the growth of the deposit is not improved, it impact on banks' liquidity. The excess liquidity condition of banking industry is presented in below:

Table 1: Excess liquidity in banking industry

Year	Amount (Crore in TK)
December, 2017	86,696
March, 2018	72,750
June, 2018	79,650
September, 2018	81,088
December, 2018	76,393
February, 2019	63,921

Source: <https://www.thedailystar.net/business/news/liquidity-crunch-intensifying-1742770>

According to the Bangladesh bank the excess liquidity in banking industry as the surplus amount stood at TK. 63,921 crore as of February 2019 which is down by 5.82 percent from a month earlier and 14.56 percent year on year. The data in the above table is presented below in chart:

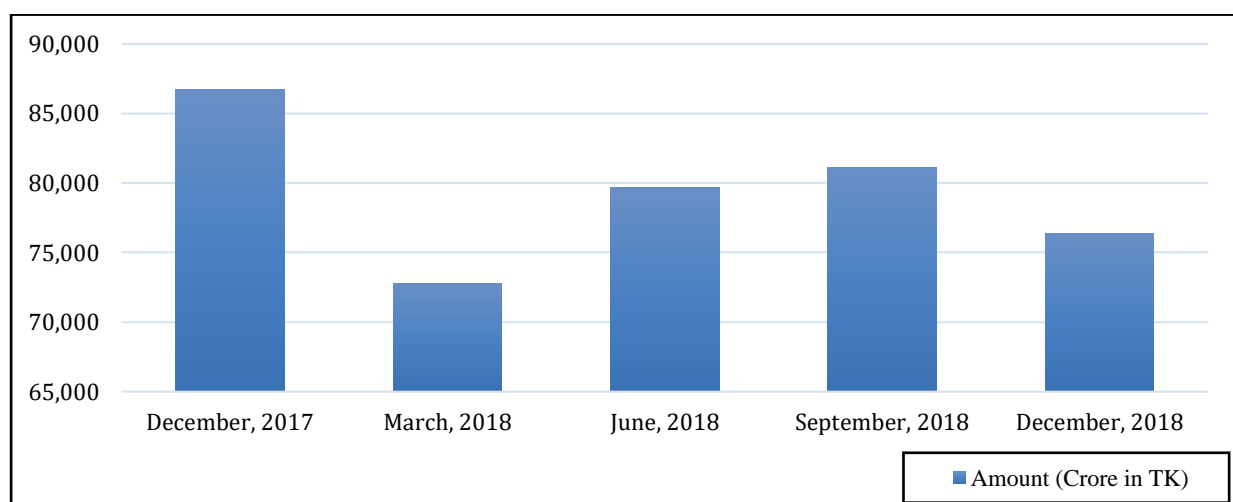


Figure 2: Excess Liquidity in Banking Industry

The above graph showed that the excess liquidity in banking sector is not consistent and the sharp declined of excess liquidity of banking sector as of February, 2019. So, it is cleared that the liquidity position of banking industry is not satisfactory as it is represented by the height of each bar of the chart.

The deposit growth of the banking industry is declining from the December, 2017 which is not changed. The deposit growth of banking industry is given below in table:

Table 2: Deposit growth of banking industry

Year	Deposit Growth (in percentage)
December, 2017	10.22%
March, 2018	8.84
June, 2018	10.29
September, 2018	9.15
December, 2018	9.04
February, 2019	9.90

Source: <https://www.thedailystar.net/business/news/liquidity-crunch-intensifying-1742770>

The deposit growth of the banking industry is declining tend after June, 2018 but in February, 2019 is changed as increased compared to December, 2018. As increased in interest rate is offer by banking industry, the deposit growth rate is increased in this year. The deposit growth of banking industry is presented below in chart:

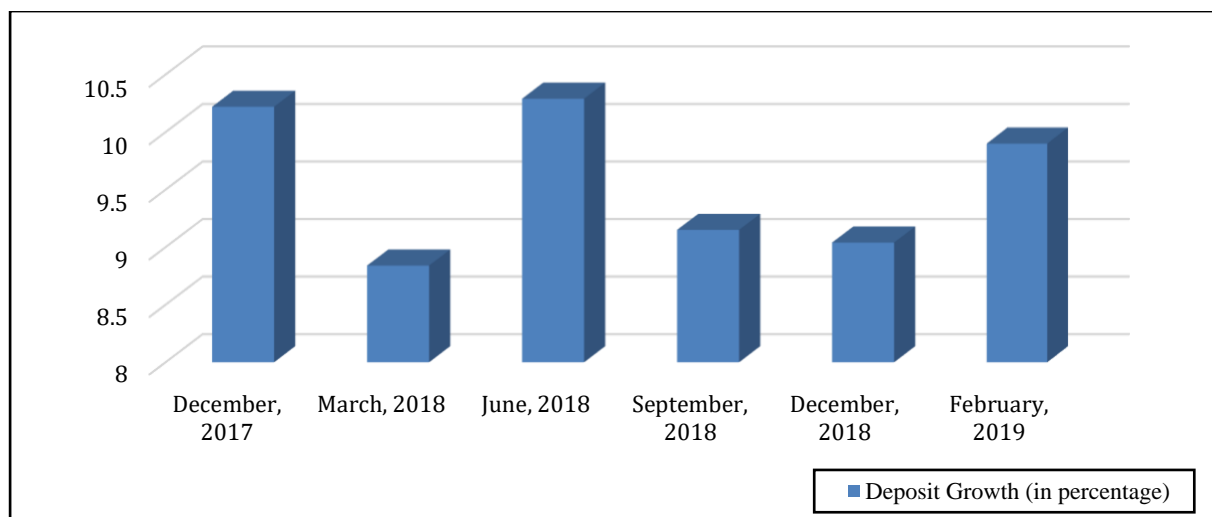


Figure 3: Deposit Growth of Banking Industry

The deposit growth of banking industry is not consistent as there is up and down trend in the growth as shown in the above chart. The liquidity crunch is happened in recent time due to the lethargic deposit growth of the banking industry.

The upward trend of default loan is one of the reasons of the liquidity crunch as the banking sector stood at 93,370 crore which is 10.30 percent of total outstanding loan. Due to default loan is climb up in the banking industry, general people is not feeling comfort to save their funds in the banks. They are switching their funds from banks to other safe profitable sources like national savings certificate. So, the liquidity position of banking sector is not in satisfactory level from the last year and its continuing.

In 2018, banking sector was experienced a liquidity crisis. To meet customers' withdrawals demand, Bangladesh Bank was compelled to lend TK.3500 crore to the banks. The amount of fund borrowed by different banks to meet liquidity crisis through inter-bank borrowing is given below in table:

Table 3: Inter-bank Borrowing

Banks' Name	Amount (Crore in TK)
AB Bank Limited	400
Eastern Bank Limited	183
Trust Bank Limited	50
National Bank Limited	97.5
NRB Bank Limited	41
Uttara Bank Limited	27
Standard Bank Limited	25

Source: <https://archive.bangladesh-post.net/banks-facing-liquidity-crisis/>

So, the banking industry is facing liquidity crisis from 2018 and it is continuing as shown in the above table. The AB bank limited is in the top of table in terms of inter-bank borrowing to meet up their obligation towards customers.

To mitigate the problem regarding liquidity, there are taken a lot of steps by government and Bangladesh Bank. Like; adjusting the limit of advance to deposit ratio, to increase tax over the interest earn from national savings certificate and so on.

6.2 Analysis:

The numbers of scheduled banks in Bangladesh are 61 including 6 state-owned banks, 3 specialized banks, 33 conventional private commercial banks, 10 islamic banks and 9 foreign banks. To conduct comparative analysis between public sector and DSE listed private sector banks based on the effect of liquidity management on profitability, are taken 9 banks from public sector bank (including 6 state-owned banks and 3 specialized banks) and 9 banks from conventional private commercial banks as sample in this study. The nine public sector banks which are taken in this study, they are: Sonali Bank Limited, Janata Bank Limited, Agrani Bank Limited, Rupali Bank Limited, BASIC Bank Limited, Bangladesh Development Bank Limited (BDBL), Bangladesh Krishi Bank (BKB), Rajshahi Krishi Unnayan Bank (RAKUB) and Probashi Kallyan Bank (PKB). The nine banks of DSE listed private sector banks which is taken as sample in this study, they are: AB Bank Limited, Eastern Bank Limited, Trust Bank Limited, Dhaka Bank Limited, Prime Bank Limited, City Bank Limited, Brac Bank Limited, Pubali Bank Limited and Standard Bank Limited. To analysis between public sector and DSE listed private sector banks takes data from the period 2013 to 2017. In this study, to identify the relationship between liquidity management and profitability is used some ratios: for assessing banks' efficiency in liquidity management is used current ratio, cash-deposit ratio, credit-deposit ratio and investment-deposit ratio and for assessing profitability of the banks is used return on assets (ROA) and return on equity (ROE) ratios. The comparative analysis between public sector and DSE listed private sector banks based on the effects of liquidity management on profitability (by using some financial ratios) is described below in terms of mean, standard deviation, correlation and regression:

6.3. Descriptive statistics

The effect of liquidity management on profitability of public sector and DSE listed private sector banks is assessed by using descriptive statistics tools such as mean, standard deviation, maximum and minimum values of the variables. The descriptive statistics of liquidity management and profitability of public sector and DSE listed private sector banks, through using financial ratios (current ratio, cash-deposit ratio, credit-deposit ratio, investment-deposit ratio, return on assets and return on equity) during the period from 2013 to 2017, is calculated in terms of mean and standard deviation. To compare liquidity management and profitability of public sector and DSE listed private sector banks, the descriptive statistics is given below in table:

Table 4: Descriptive statistics of measures of liquidity management and profitability Public Sector Banks

Variables	Minimum	Maximum	Mean	Standard Deviation (%)
Current Ratio (CR)	0.7355	4.0681	1.4398	1.0206
Cash-Deposit Ratio (CDR)	0.4619	9.6047	7.1499	2.6419
Credit-Deposit Ratio (CRDR)	42.0984	292.2851	99.7656	76.3696
Investment-Deposit Ratio (IDR)	0.0000	43.3784	24.2977	18.7909
Return on Assets (ROA)	-4.5386	1.6350	-0.4437	2.0318
Return on Equity (ROE)	-36.4391	20.6735	-0.7681	17.5584

Table 5: Descriptive statistics of measures of liquidity management and profitability DSE listed Private Sector Banks

Variables	Minimum	Maximum	Mean	Standard Deviation (%)
Current Ratio (CR)	0.9402	1.2166	1.0692	0.9758
Cash-Deposit Ratio (CDR)	7.1558	11.3293	9.2191	1.4609
Credit-Deposit Ratio (CRDR)	77.1266	92.21111	84.6103	5.1257
Investment-Deposit Ratio (IDR)	14.3918	26.4405	18.9023	3.9804
Return on Assets (ROA)	0.3734	1.2984	0.9174	0.3109
Return on Equity (ROE)	4.7681	15.4962	10.8890	3.2890

According to tables the analysis through descriptive statistics showed that the measure of profitability such as ROA and ROE of public sector banks are -0.4437 and -0.7681 respectively (on average) whereas ROA and ROE of DSE listed private sector banks are 0.9174 and 10.8890 respectively (on average). So, the DSE listed private sector banks are more effectively and efficiently performed than public sector banks in terms of profitability. The mean values of liquidity measures such as CR, CDR, CRDR and IDR of public sector are 1.4398, 7.1499, 99.7656 and 24.2977 respectively. On the other hand, the mean value of CR, CDR, CRDR and IDR of DSE listed private sector are 1.0692, 9.2191, 84.6103 and 18.9023 respectively. The CR and CDR of DSE listed private sector is higher than public sector and the CRDR and IDR ratio of public sector is higher than DSE listed private sector. In spite of higher CRDR and IRD, the public sector banks' profitability is lower than DSE listed private sector banks'. This means, the liquidity management of DSE listed private sector banks is more efficient than public sector banks in Bangladesh based on the measures of descriptive statistics.

6.4. Correlation

The correlation between measures of liquidity management such as current ratio (CR), cash-deposit ratio (CDR), credit-deposit ratio (CRDR) and investment-deposit ratio (IDR) and measures of profitability such as return on assets (ROA) and return on equity (ROE) is analyzed by using Pearson Correlation. The correlation between different measures of liquidity management profitability of public sector and DSE listed private sector banks is given below:

Table 6: Correlation between different measures of liquidity and profitability of public sector banks

Variables		CR	CDR	CRDR	IDR	ROA	ROE
CR	Pearson Correlation	1	-.927**	.943**	-.533	.335	.177
	Sig. (2-tailed)		.000	.000	.140	.378	.648

CDR	Pearson Correlation	-.927**	1	-.875**	.301	-.511	-.031
	Sig. (2-tailed)	.000		.002	.432	.160	.937
CRDR	Pearson Correlation	.943**	-.875**	1	-.696*	.188	-.092
	Sig. (2-tailed)	.000	.002		.037	.628	.815
IDR	Pearson Correlation	-.533	.301	-.696*	1	.527	.130
	Sig. (2-tailed)	.140	.432	.037		.145	.739
ROA	Pearson Correlation	.335	-.511	.188	.527	1	.177
	Sig. (2-tailed)	.378	.160	.628	.145		.648
ROE	Pearson Correlation	.177	-.031	-.092	.130	.177	1
	Sig. (2-tailed)	.648	.937	.815	.739	.648	
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Table 7: Correlation between different measures of liquidity and profitability of DSE listed private sector banks

Variables		CR	CDR	CRDR	IDR	ROA	ROE
CR	Pearson Correlation	1	-.142	-.654	.548	.318	-.237
	Sig. (2-tailed)		.715	.056	.127	.405	.539
CDR	Pearson Correlation	-.142	1	-.238	-.268	.662	.635
	Sig. (2-tailed)	.715		.537	.486	.052	.066
CRDR	Pearson Correlation	-.654	-.238	1	-.518	-.338	-.088
	Sig. (2-tailed)	.056	.537		.153	.374	.823
IDR	Pearson Correlation	.548	-.268	-.518	1	-.295	-.546
	Sig. (2-tailed)	.127	.486	.153		.441	.128
ROA	Pearson Correlation	.318	.662	-.338	-.295	1	.782*
	Sig. (2-tailed)	.405	.052	.374	.441		.013
ROE	Pearson Correlation	-.237	.635	-.088	-.546	.782*	1
	Sig. (2-tailed)	.539	.066	.823	.128	.013	
*. Correlation is significant at the 0.05 level (2-tailed).							

The correlation between ROA as profitability measure and CR (0.335), CRDR (0.188) and IDR (0.527) of public sector banks are positive and not statistically significant. On the other hand, the correlation between ROA and CDR (-0.511) of public sector banks is negative which is statistically insignificant. There are positive correlation between profitability measures as ROE and liquidity measures as CR (0.177) and IDR (0.130) but not statistically significant. Whereas there are negative correlation between profitability measures as ROE and liquidity measures by the ratios as CDR (-0.031) and CRDR (-0.092) but not statistically significant.

The correlation between profitability variables as measured by ROA and Liquidity variables as measured by CR (0.318) is positive for the DSE listed private sector banks which are not statistically significant. On the other hand, there are negative correlation between ROA and liquidity variables as measured by CRDR (-0.338) and IDR (-0.295) that is not statistically significant. In private sector banks, there is positive correlation between ROE and CDR (0.635) which are statistically insignificant. The correlation between ROE of DSE listed private sector banks and Liquidity variables as measured by CR (-0.237), CRDR (-0.088) and IDR (-0.0546) are found to be negative which are not statistically significant. It is found that correlation between profitability variables and liquidity variables, all are statistically insignificant for both public sector and DSE listed private sector banks.

6.5. The effect of liquidity management on profitability of public sector and DSE listed private sector banks and comparative analysis between public sector and DSE listed private sector banks:

To assess the effect of liquidity management on profitability of public sector and DSE listed private sector banks, is used the data for the period from 2013 to 2017 on average of nine public sector and DSE listed private sector banks each (in total 18 banks) and developed regression model. In this model return on assets and return equity as measure of profitability are considered as dependent variables in each regression model. On the other hand, current ratio (CR), cash-deposit ratio (CDR), credit-deposit ratio (CRDR) and Investment-deposit ratio (IDR) as measures of liquidity are considered as independent variables. The summary of regression model is presented in below:

Table 8: Model summary and ANOVA (F) test result of public sector banks (Dependent Variable: ROA)

Variables	Coefficient (B)	Standard Error	t value	Significant
(Constant)	-0.189	0.067	-2.811	0.048
CR	0.008	0.010	0.828	0.454
CDR	0.920	0.500	1.842	0.139
CRDR	0.057	0.021	2.705	0.054
IDR	0.204	0.043	4.783	0.009

$R=0.966$, $R^2=0.933$, Adjusted $R^2=0.865$, F-value=13.869 at p-value=0.013

Table 9: Model summary and ANOVA (F) test result of DSE listed private sector banks (Dependent Variable: ROA)

Variables	Coefficient (B)	Standard Error	t value	Significant
(Constant)	-0.018	0.033	-0.553	0.610
CR	0.022	0.011	1.955	0.122
CDR	0.132	0.061	2.149	0.098
CRDR	-0.001	0.023	-0.023	0.982
IDR	-0.039	0.025	-1.590	0.187

$R=0.882$, $R^2=0.777$, Adjusted $R^2=0.555$, F-value=3.492 at p-value=0.127

Based on the above outcomes, the regression model for the public sector bank becomes:

$$Y1 (\text{ROA}) = - 0.189 + 0.008 \text{ CR} + 0.920 \text{ CDR} + 0.057 \text{ CRDR} + 0.204 \text{ IDR}$$

Based on the above outcomes, the regression model for the DSE listed private sector bank becomes:

$$Y2 (\text{ROA}) = - 0.018 + 0.022 \text{ CR} + 0.132 \text{ CDR} - 0.001 \text{ CRDR} - 0.039 \text{ IDR}$$

According to the above results, it is found that the relationship between dependent variable (ROA as profitability measure) and independent variables (CR, CDR, CRDR and IDR as liquidity measures) are positive for the public sector banks. On the other hand, the positive relationship between ROA and explanatory variables: CR and CDR

are found and the negative relationship between ROA and explanatory variables: CRDR and IDR are found for the DSE listed private sector banks. Based on t value for the public sector banks, the calculated t values for the CR and CDR are less than table value at 5% significant level which indicates these two explanatory variables have no significant impact on dependent variables. On the other hand, the calculated t value for the CRDR and IDR are more than tabular value. So it indicates, these two variables have significant impact on dependent variable ROA. The t value for the DSE listed private sector banks, the calculated t values are less than tabular value for all explanatory variables. This means, all explanatory variables have no significant impact over the dependent variable ROA.

The two-tailed p value reveal that the explanatory variables have no significant impact over dependent variable of public sector banks as the values are greater than 0.05 expect for the IDR.

This means IDR has significant impact on the dependent variable ROA of public sector banks as the p value is less than 0.05. On the other hand, the p values of explanatory variables of DSE listed private sector banks are greater than 0.05 which indicates explanatory variables have not significant impact on dependent variables.

The F value of public sector is more than tabular value for the public sector banks which means the explanatory variables have significant relationship with dependent variable. This can be concluded that there is significant relationship between liquidity and profitability of public sector banks and rejected the null hypothesis. The p value (0.013) is less than 0.05 which is also indicated there is significant relationship between liquidity and profitability of public sector banks as ROA considered as dependent variable.

The F value of DSE listed private sector banks is less than tabular values and p value is also more than 0.05. This means that there is no significant relationship between liquidity and profitability of DSE listed private sector banks. So, the explanatory variables have no significant impact over the dependent variable ROA of the DSE listed private sector banks.

The R^2 of the both public sector and DSE listed private sector banks reveal that the explanatory variables can explain the dependent variable 93.3% and 77.7% respectively. The adjusted R^2 values of public sector and DSE listed private sector banks are 86.5% and 55.5% respectively which are statistically significant. According to the adjusted R^2 , there is significant relationship between liquidity and profitability for public sector and DSE listed private sector banks.

The overall result is that there is significant relationship between liquidity and profitability (as measured by ROA) for the public sector banks according to the t-values, p-values and F value result. So, the null hypothesis can reject for the public sector banks. There are positive relationship between explanatory variables and dependent variables ROA. On the other hand, for DSE listed private sector banks it is found that there is no significant relationship between liquidity and profitability according to the t values, p-values and F-value expect the adjusted R^2 . So, the null hypothesis cannot be rejected. The relationship between liquidity and profitability (as measures by ROA) of DSE listed private sector banks is not significant or it can be said there is no relationship between them according to the above result. So there is a possibility that DSE listed private sector banks are efficient in liquidity management that help them to keep liquidity and maintain profitability at the same time.

But it is difficult to say the liquidity management of DSE listed private sector banks is more efficient than public sector banks. Because there is negative relationship found in CRDR and IDR as liquidity measures and ROA profitability measures. On the other hand, public sector banks profitability is positively related with liquidity (measured by ROA) which is a good indication.

To verify further, the impact on liquidity management on profitability of public sector and DSE listed private sector banks is taken ROE as measure of profitability instead of ROA as dependent variable in the regression model. The summary of regression model is presented in below:

Table 10: Model summary and ANOVA (F) test result of public sector banks (Dependent Variable: ROE)

Variables	Coefficient (B)	Standard Error	t value	Significant
(Constant)	-0.171	1.048	-0.163	0.878
CR	0.548	0.158	3.481	0.025
CDR	2.412	7.779	0.310	0.772
CRDR	-0.706	0.330	-2.138	0.099
IDR	-0.389	0.666	-0.585	0.590

$R=0.884$, $R^2=0.782$, Adjusted $R^2=0.563$, F-value=3.579 at p-value=0.122

Table 11: Model summary and ANOVA (F) test result of DSE listed private sector banks (Dependent Variable: ROE)

Variables	Coefficient (B)	Standard Error	t value	Significant
(Constant)	0.358	0.458	0.781	0.478
CR	-0.036	0.154	-0.235	0.826
CDR	0.851	0.859	0.991	0.378
CRDR	-0.235	0.322	-0.730	0.506
IDR	-0.476	0.346	-1.378	0.240

$R=0.783$, $R^2=0.612$, Adjusted $R^2=0.225$, F-value=1.579 at p-value=0.334

Based on the above outcomes, the regression model for the public sector bank becomes:

$$Y1 (\text{ROE}) = -0.171 + 0.548 \text{ CR} + 2.412 \text{ CDR} - 0.706 \text{ CRDR} - 0.389 \text{ IDR}$$

Based on the above outcomes, the regression model for the DSE listed private sector bank becomes:

$$Y2 (\text{ROE}) = 0.358 - 0.036 \text{ CR} + 0.851 \text{ CDR} - 0.235 \text{ CRDR} - 0.476 \text{ IDR}$$

According to the above results, it is indicated that there are positive relationship between ROE as profitability measure and CR and CDR as liquidity measures and be negative relationship between ROE and liquidity variables measure as CRDR and IDR for the public sector banks. On the other hand, there is positive relation between CDR and ROE and negative relationship between liquidity variables as measured by CR, CRDR and IDR and profitability as measured by ROE for the DSE listed private sector banks according to the above model. But according to the t values of each explanatory variables are less than tabular values at 5% significant level for the public sector banks which indicate explanatory variables have no significant impact over dependent variables ROE expect the CR. The CR has significant impact over ROE for the public sector banks. For the DSE listed private sector banks, it is found that t values of each explanatory variables are less than tabular value at 5% significant level. This means that the explanatory variables have no significant over dependent variable ROE.

The two-tailed p-values of explanatory variables are greater than 0.05 for both of the public sector and DSE listed private sector banks that means the explanatory variables have no significant impact over dependent variable ROE.

The F-value of the regression model for the public sector banks is less than the tabular value which indicates there is no significant impact or relationship between independent variables and dependent variable. The p-value of the model is greater than 0.05 which indicates the same outcome for public sector banks. On the other hand, the F-value of DSE listed private sector banks is less than tabular values that means there is no significant relationship between liquidity and profitability (measured by ROE) and the p-value is also greater than 0.05 which means the independent variables (liquidity as measured by CR, CDR, CRDR and IDR) have no significant impact over dependent variable (profitability as measured by ROE). So, there are no significant relationship between liquidity and profitability for both public sector and DSE listed private sector banks according to the F- value of the each model.

The R^2 of the both public sector and DSE listed private sector banks reveal that the explanatory variables can explain the dependent variable 78.2% and 61.2% respectively. The adjusted R^2 values of public sector and DSE

listed private sector banks are 56.3% and 22.5% respectively which are statistically significant. According to the adjusted R^2 , there is significant relationship between liquidity and profitability for public sector and DSE listed private sector banks. There is a gap between R^2 and adjusted R^2 because there are many independent variables that impact on profitability of banking industry other than included variables for this study.

The overall result indicates that there is no significant relationship between liquidity and profitability of public sector banks according to the t-values, p-values and F value. So, the null hypothesis cannot be rejected. On the other hand, there is no significant relationship between liquidity and profitability of DSE listed private sector banks according to the t-values, p-values and F value and the null hypothesis cannot be rejected. So, it indicates that the liquidity management of public sector and DSE listed private sector banks is good enough to immunize the negative relationship between liquidity and profitability. The public sector and DSE listed private sector banks are able to maintain liquidity position in desire level and earn profit at the same time.

It is found that there is significant relationship between liquidity and profitability for the public sector banks in case of measuring profitability by ROA. On the other hand, there is no significant relationship between liquidity and profitability in case of measuring profitability by ROE. So, the public sector banks are perform liquidity management function well that is not effecting profitability of the banks. But the CRDR and IDR have negative relationship on profitability as measured by ROE which is not statistically significant. In spite of that, public sector banks need to take initiative on that. As the non-performing loan amount is so high that is one of the reasons for negative relationship with profitability. On the other hand, there is no significant relationship between liquidity and profitability of DSE listed private sector banks in both cases when the profitability either measure by ROA and ROE. So, the DSE listed private sector banks are performed very well to keep their liquidity position at desired level without effecting profitability. To compare between public sector and DSE listed private sector, the DSE listed private sector banks perform their liquidity management function better than public sector banks. As DSE listed private sector banks' profitability as measured by ROA and ROE, there is no significant relation between liquidity and profitability. So, it is indicated that DSE listed private sector perform very well in terms of liquidity management compare to public sector banks in Bangladesh. Based on the result of the descriptive statistics, the standard deviation of liquidity as measured by CR, CDR, CRDR and IDR of public sector banks are higher than DSE listed private sector banks. On the other hand, the profitability as measured by ROA and ROE of public sector banks are higher than DSE listed private sector banks. So, the public sector banks are more volatile than DSE listed private sector banks in terms of liquidity and profitability. The standard deviation of public sector banks is volatile because some banks liquidity measures are less stable than others banks in public sector especially Rajshahi Krishi Unnayan Bank (RAKUB) and Probashi Kallyan Bank (PKB). So, based on the outcomes of all measures it can be concluded that DSE listed private sector banks are more efficient than public sector banks in terms of liquidity management and maintain profit at a certain level at the same time. The public sector banks should improve their liquidity management function with a standard framework to remain competitive with DSE listed private sector banks in Bangladesh.

7. Findings and Recommendations:

7.1. Findings

The findings of the study regarding the effect of liquidity management on profitability of public sector and DSE listed private sector banks are given below:

1. The profitability as measured by return on assets (ROA) and return on equity (ROE) of public sector banks is found negative through descriptive measures. Because the return on assets and return of equity of some banks in public sector are fluctuated more than others especially the return on assets (ROA) and return on equity (ROE) of Rajshahi Krishi Unnayan Bank (RAKUB) and Probashi Kallyan Bank (PKB) during the five years. The profitability as measured by return on assets (ROA) and return on equity (ROE) of public sector banks is found positive which is good indication of performing well in terms of generating profit by proper utilizing assets and owners' fund of banks.
2. It is found that there is significant relationship between liquidity and profitability of public sector banks when the profitability is measured by return on assets (ROA). As, return on assets ROA is negative for

the public sector banks and the positive relationship is found by regression model. It is indicated that the explanatory variables such as current ratio (CR), cash-deposit ratio (CDR), credit-deposit ratio (CRDR) and investment-deposit ratio (IDR) are influenced profitability positively but not in reality. As, the non-performing loan of the public sector banks is one of the reason of that. In spite of increasing outstanding credit and investment, the return on assets is not increasing at same speed. On the other hand, there is no significant relationship is found between liquidity and profitability of public sector banks when the profitability is measured by return on equity ROE.

3. For the DSE listed private sector banks, it is found that there is no significant relationship between liquidity and profitability in both cases either profitability is measured by return on assets ROA and return on equity ROE. So, it is indicated that the DSE listed private sector banks are performed their liquidity management function well so that the liquidity is not affecting the profitability. In spite of the insignificant relationship between liquidity and profitability, the model has negative relationship with profitability. The DSE listed private sector banks have efficient liquidity management that is the reason behind the insignificant negative relationship between liquidity and profitability. This type of finding is also found by Birajit Mohanty and Shweta Methrotra (2018) for the private sector banks in India. In that study, they found no significant relationship between liquidity and profitability of private sector banks in India as like this study is found the relationship between liquidity and profitability of DSE listed private sector banks in Bangladesh is insignificant.
4. So, the liquidity management of DSE listed private sector banks is more efficient than that of public sector banks. As, DSE listed private sector banks are immunized the liquidity on profitability that is revealed by regression analysis as insignificant relationship between liquidity and profitability (as measured by either ROA or ROE). On the other hand, different results are found for public sector banks. Because of those, it cannot be said that the liquidity management is efficient. Based on the result, the DSE listed private sector banks are ahead of public sector banks in term of liquidity management.

These are the ultimate finding of the study regarding liquidity management and its impact over profitability of public and DSE listed private sector banks.

7.2. Recommendations

The recommendations of the study based on the findings the effect of liquidity management on profitability of public sector and DSE listed private sector banks are given below:

1. The public sector banks need to take corrective measures and steps so that it can improve its return on assets (ROA) and return on equity (ROE). The liquidity management is one of the key areas that need to improve as well. The return on assets and return on equity can also be generating by efficiently allocating the assets of the banks and producing profit with stability. On the other hand, the DSE listed private sector banks' return on assets and return on equity are in positive and they need to continue the growth of turn on assets (ROA) and return on equity (ROE) with taking right steps in right time.
2. As there is significant relationship between liquidity and profitability (as measured by ROA) is found significant for the public sector banks, the banks should take initiative care of that like the banks should keep as much as cash needed to fulfill customer demand and invest and lend funds in the profitable sectors. So, banks can generate more return in terms of assets and equity. On the other hand, the relationship between liquidity and profitability (as measured by ROE) is found insignificant for the public sector banks that is a good indication for the public sector banks' liquidity management.
3. The relationship between liquidity and profitability (as measured by either ROA or ROE) is not significant. This means that the DSE listed private sector banks have efficient liquidity management framework with effective initiatives. The banks need to improve their liquidity management function more so that the insignificant negative relationship between credit-deposit and return on assets (ROA) and return on equity (ROE) is not come to in effect.
4. The comparative result is showed that the DSE listed private sector banks are ahead of public sector banks. So the public sector banks should take initiative so that they can improve their condition. The current ratio (CR), cash-deposit ratio (CDR), credit-deposit ratio (CRDR) and investment-deposit ratio

(IDR) of public sector need to be improved. According to the result, the public sector banks, need to improve their liquidity position by attracting more deposit and invest and lend those funds to the diversified profitable sector. At the same time, the recovery of the loan needs to be ensured so that the non-performing loan is not climbing up more.

These are the recommendations according to finding of the study regarding liquidity management and its impact over profitability of public and DSE listed private sector banks.

8. Conclusion:

This study is all about the effect of liquidity management on profitability of public sector and DSE listed private sector banks and conducts a comparative analysis between these two sectors based on the outcomes. After analyzing, it is found that the liquidity management of DSE listed private sector banks is more efficient than public sector banks. As there is no significant relationship between liquidity and profitability of DSE listed private sector banks based on the data for period 2013 to 2017. The result can be change if the other independent variables included in the model other than included variables in this study. The liquidity growth of the banking industry is in lethargic trend especially from the 2018 and in declined trend. So, the liquidity management plays a crucial role on the present condition. According to the results, it can be said that DSE listed private sector banks are able to face the current condition more better way than public sector banks. So, the public sector banks should take initiatives to improve their liquidation management function at the same time to improve the return on assets and return on equity. So, this study reveals the potential of public sector and DSE listed private sector banks based on liquidity management and its effect on profitability.

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