Impact of Liquidity on Bank's Profitability: A Study on HDFC Bank

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ABSTRACT:*Theresearch paper focuses on the study of the relationship between liquidity and profitability of HDFC Bank. This has been done by analysing the relationship between liquidity ratios and profitability ratios. The liquidity ratios used for the study are Credit to Deposit ratio, Cash and Bank Balance to Deposit ratio, Loan to Total Asset ratio, Total Liquid Funds to Deposit ratio and Liquid Asset to Total Asset ratio, whereas the profitability ratio used \are Return on Asset (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). The statistical tool used for testing the relationship is Regression Analysis. The findings from the study implied that while liquidity did have an impact on ROA, it had no significant impact on ROE and NIM. Thus overall, it can be concluded from the study that liquidity does not have a significant impact on profitability in case of HDFC bank.*
KEY WORD:*Liquidity, Profitability, Bankruptcy, Indian Banks, Regression*

I.   INTRODUCTION

In 2018, when the growth slowdown had begun, credit growth being pro-cyclical slowed down across major economies, which, in turn, had adversely affected bank profitability (Reserve Bank of India 2019). However, in the last three decades, RBI introduced major banking reforms to improve the strength, health, performance and profitability of the banking industry. These reforms were aimed to improve the quality of regulation, create healthy competition, and efficient functioning of banking industry. Thus all these changes had some impact on the bank's profitability and performance (Bezawada and Ranajee 2018).

In general, banking involves mobilisation of funds from excess or surplus units of the economy to deficit units as loans, thus reactivating the idle funds and putting them into productive use. This is financial intermediation. Banks thrive on the financial intermediation abilities that allow them to lend out money and receive money on deposit. A well-functioning financial system is fundamental to the development of the economy. Because of the nature of the business, banks are exposed to a number of risks. One of them is liquidity. Liquidity is the ability of the bank to ensure the availability of funds to meet its contractual obligations as and when they fall due. It refers to the capability of a bank to retain enough funds to meet its maturing obligations. Liquidity risk refers to the risk of loss to a bank resulting from its inability to meet its financial obligation due to lack of funds. This risk arises from the funding of long-term assets by short-term liabilities. Banks lend finances in relatively illiquid assets, but the funds for its loans mostly comes from short term liabilities. Liquidity risk includes both the inability of funding assets at appropriate maturities and rates and the inability to liquidate an asset in an appropriate time frame and at a fair price. This might result in rollover or refinancing risk. Thus, it is a crucial task for a bank to ensure its own liquidity under all reasonable conditions.

Banks financial stability is ensured through its profitability which is its first line of defence against any losses that may arise from credit impairment. Also, retained earnings are an important source of capital as they enable banks to build strong buffers to absorb additional losses. These buffers ensure that banks are able to provide financial services even in the face of adversity. Banks with poor structural profitability may have to face higher funding costs thus tempting them to take on more risk to increase their returns. Profitability or sustainability of a bank can be subject to its liquidity standing. It is important for banks to take proper care in hedging liquidity risk while at the same time ensuring that a good percentage of funds are invested in higher return generating investment. By doing so banks can ensure that they generate profit and at the same time provide liquidity to the depositors. Thus, liquidity management needs to be done in order to mitigate two types of risks; the first one is having a high level of liquidity which will reduce the return on assets thus hampering the overall profitability of the bank and the second one is the risk of low liquidity levels which will lead to attracting other sources of deposits which are expensive and will thus reduce the profitability of the bank.

II.   LITERATURE REVIEW

Liquidity: Bessis (2015) defines liquidity as the ability of the bank to meet its obligations whenever due without incurring a significant loss. In the past, liquidity ratios have been relied upon to measure the liquidity risk of the bank. In order to get a general view on the impact of liquidity in the banking sector, liquidity ratios and liquidity measures - derived directly from the banks' balance sheets were used for studying the liquidity risk by Kalanidis (2016). However, Poornam& Blake (2005), indicated that liquidity ratios are not sufficient to measure liquidity position and hence researchers should not rely only on them when they try to measure the liquidity in banks. Credit to Deposit ratio was the measure used by Moore (2009) to measure the liquidity position of the bank. A higher ratio indicates less liquidity in the bank. Also, Vadova (2013) in their paper have used Liquid Asset to Total Asset ratio as a measure of liquidity of the bank. This ratio indicates the shock absorption capacity of the bank. Other liquidity ratios as used by Lama (2018)in her research paper are Cash and Bank Balance to Deposit ratio, Liquid Asset to Total Asset ratio and Total Liquid Fund to Deposit ratio.

Profitability: Yuksel, Mukhtarov, Mammadov, & Mustafa (2018) in their paper referred to Bank Profitability as the difference between the profit amount obtained from the assets and expense of the liabilities. In the majority of the papers reviewed, the commonly used measures of profitability were ROA, ROE and NIM for banks. In most of the studies, it was expressed as a function of internal as well as external factors. Dimitrios (2016) used ROAA, ROAE, NIM and PBT to measure the profitability of banks. Another study conducted by Ahmad (2016) used Gross Profit Margin, Net Profit Margin, ROE and ROA to measure bank profitability. A study conducted by Boateng (2018) found that the profitability of banks was mainly influenced by credit risk, capital adequacy and inflation. Another study by Al-Homaidi, Tabash, Farhan, Almaqtari, & McMillan (2018) concluded that bank size, asset management ratio, asset quality ratio and liquidity ratio have a significant positive impact on ROE of banks in India.

Relationship between Liquidity & Profitability: Bourke (1989) in his study on the performance of banks in twelve countries in Europe, North America and Australia found evidence that there is a positive relationship between liquid assets and bank profitability. Another study conducted by Waleed, Pasha and Akhtar (2016) revealed that there was a strong positive relationship between liquidity and profitability. Similarly, according to Sur et al (2001), Bardia (2007), Bardia (2004) and Sur and Ganguly (2001), there is a positive relationship between liquidity and profitability. As liquidity has a close relation with day to day activities so the study of liquidity is important for the internal analysts as well as external analysis in their study (Bhunia, 2010). On the contrary Lartey, Antwi and Boadi (2013) in their study on listed banks in Ghana found that there was a weak positive relationship between liquidity and profitability of banks. Also, the study conducted by Sthapit (2012) also concluded no significant relationship between liquidity and profitability. Similarly, the study conducted by Shreshtha (2012) also established the same results. Both cash and bank balance to deposit and total liquid fund to total deposit had no significant relationship with the ROA. The research by Salim & Mohamed (2016) found no significant impact of liquidity ratios on ROA and ROE but there was both a positive and negative relationship of liquidity ratios with NIM.

III.   RESEARCH METHODOLOGY
3.2   Research Objectives
To determine whether Credit to Deposit ratio has a significant relationship with ROA, ROE and NIM.
To determine whether Cash and Bank Balances to Deposit ratio has a significant relationship with ROA, ROE and NIM.
To determine whether Loan to total assets ratio has a significant relationship with ROA, ROE and NIM.
To determine whether the Total Liquid Fund to Deposit ratio has a significant relationship with ROA, ROE and NIM.
To determine whether Liquid Assets to Total Assets ratio has a significant relationship with ROA, ROE and NIM.

3.3   Variables
Independent variable: The independent variables used in this study are the liquidity ratios namely Credit to Deposit Ratio, Cash and Bank Balance to Deposit Ratio, Loan to Total Assets Ratio, Total Liquid Fund to Deposit Ratio and Liquid Assets to Total Assets Ratio.
Dependent variable: In this study, the bank's liquidity will be examined on the profitability ratios namely Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). This will help in providing a strong indication regarding the relationship between liquidity and profitability.

Table 1: Conceptual Model
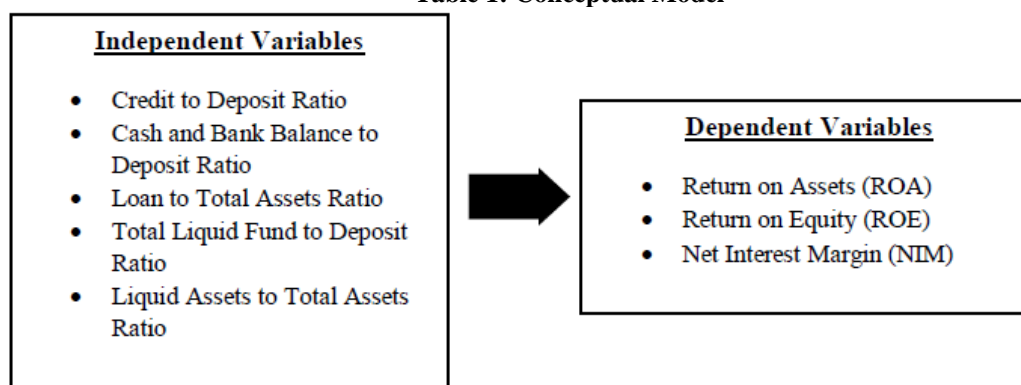
3.4 Hypothesis

H1: To test the relationship between Credit to Deposit Ratio and ROA

Null Hypothesis: There is no statisticallysignificant relationship between Credit to Deposit Ratio and ROA.

Alternative Hypothesis: There is a statistically significant relationship between Credit to Deposit Ratio and ROA.

H2: To test the relationship between Cash and Bank Balance to Deposit Ratio and ROA

Null Hypothesis: There is no statistically significant relationship between Cash and Bank Balance to Deposit Ratio and ROA.

Alternative Hypothesis: There is a statistically significant relationship between Cash and Bank Balance to Deposit Ratio and ROA.

H3: To test the relationship between Loan to Total Assets Ratio and ROA

Null Hypothesis: There is no statistically significant relationship between Loan to Total Assets Ratio and ROA.

Alternative Hypothesis: There is a statistically significant relationship betweenLoan to Total Assets Ratio and ROA.

H4: To test the relationship between Total Liquid Fund to Deposit Ratio and ROA

Null Hypothesis: There is no statistically significant relationship between Total Liquid Fund to Deposit Ratio and ROA.

Alternative Hypothesis: There is a statistically significant relationship Total Liquid Fund to Deposit Ratio and ROA.

H5: To test the relationship between Liquid Assets to Total Assets and ROA

Null Hypothesis: There is no statistically significant relationship between Liquid Assets to Total Assets and ROA.

Alternative Hypothesis: There is a statistically significant relationship Liquid Assets to Total Assets and ROA.

H6: To test the relationship between Credit to Deposit Ratio and ROE

Null Hypothesis: There is no statistically significant relationship between Credit to Deposit Ratio and ROE.

Alternative Hypothesis: There is a statistically significant relationship between Credit to Deposit Ratio and ROE.

H7: To test the relationship between Cash and Bank Balance to Deposit Ratio and ROE

Null Hypothesis: There is no statistically significant relationship between Cash and Bank Balance to Deposit Ratio and ROE.

Alternative Hypothesis: There is a statistically significant relationship between Cash and Bank Balance to Deposit Ratio and ROE.

H8: To test the relationship between Loan to Total Assets Ratio and ROE

Null Hypothesis: There is no statistically significant relationship between Loan to Total Assets Ratio and ROE.

Alternative Hypothesis: There is a statistically significant relationship between Loan to Total Assets Ratio and ROE.

H9: To test the relationship between Total Liquid Fund to Deposit Ratio and ROE

Null Hypothesis: There is no statistically significant relationship between Total Liquid Fund to Deposit Ratio and ROE.

Alternative Hypothesis: There is a statistically significant relationship Total Liquid Fund to Deposit Ratio and ROE.

H10: To test the relationship between Liquid Assets to Total Assets and ROE

Null Hypothesis: There is no statistically significant relationship between Liquid Assets to Total Assets Ratio and ROE.

Alternative Hypothesis: There is a statistically significant relationship Liquid Assets to Total Assets Ratio and ROE.

H11: To test the relationship between Credit to Deposit Ratio and NIM
Null Hypothesis: There is no statistically significant relationship between Credit to Deposit Ratio and NIM.
Alternative Hypothesis: There is a statistically significant relationship between Credit to Deposit Ratio and NIM.

H12: To test the relationship between Cash and Bank Balance to Deposit Ratio and NIM
Null Hypothesis: There is no statistically significant relationship between Cash and Bank Balance to Deposit Ratio and NIM.
Alternative Hypothesis: There is a statistically significant relationship between Cash and Bank Balance to Deposit Ratio and NIM.

H13: To test the relationship between Loan to Total Assets Ratio and NIM
Null Hypothesis: There is no statistically significant relationship between Loan to Total Assets Ratio and NIM.
Alternative Hypothesis: There is a statistically significant relationship between Loan to Total Assets Ratio and NIM.

H14: To test the relationship between Total Liquid Fund to Deposit Ratio and NIM
Null Hypothesis: There is no statistically significant relationship between Total Liquid Fund to Deposit Ratio and NIM.
Alternative Hypothesis: There is a statistically significant relationship between Total Liquid Fund to Deposit Ratio and NIM.

H15: To test the relationship between Liquid Assets to Total Assets ratio and NIM
Null Hypothesis: There is no statistically significant relationship between Liquid Assets to Total Assets Ratio and NIM.
Alternative Hypothesis: There is a statistically significant relationship between Liquid Assets to Total Assets Ratio and NIM.

3.5   Sampling Design

Relevant Population: Listed Private banks in India are the relevant population for this study which focuses on the relationship between liquidity and profitability. It is the group of Indian private banks that are listed and actively traded on the exchange.

Sampling Method: The main sample for this study are the top 5 listed private banks on the basis of their market capitalisation. Non-probability sampling method was chosen as fit for the study. HDFC bank has been selected for the study as it is the largest private bank on the basis of market capitalisation. Moreover, HDFC Bank has also shown stable growth over the last 10 years, and thus the bank has been chosen because of its stability. It is an Indian banking and financial services company headquartered in Mumbai, Maharashtra with an annual revenue of Rs. 1.17 lakh crores and total assets worth Rs. 11.89 lakh as of 2019.

Methods of data collection: The data in terms of liquidity and profitability was collected mainly through secondary sources across a time period of 2010-2019. Annual Report and other websites like Capitaline, Yahoo.finance were used as the main source of data collection. In addition, scholarly articles and research papers were also used to facilitate the study. The duration of the data was on a yearly basis.

Introduction to the statistical tool: Regression technique was used to study the relationship between each of the liquidity ratio with profitability ratios. Quantitative analysis technique like regression was adopted for the study. Which involves identifying the relationship between a dependent variable and one or more independent variables. Wherein, a model of the relationship is hypothesized, and estimates of the parameter values are used to develop an estimated regression equation. For the purpose of regression, the profitability measures were ROA, ROE & NIM and the liquidity measures used were Credit to Deposit Ratio, Cash and Bank Balance to Deposit Ratio, Loan to Total Assets Ratio, Total Liquid Fund to Deposit Ratio and Liquid Assets to Total Assets Ratio. The least squared regression line equation was in the form:
$y = a + bx$; where = profitability (dependent variable); a = intercept; b = the slope of regression line; x = liquidity (independent variable).

IV.   DATA ANALYSIS
4.2   Dependent Variable: Return on Asset (ROA)
With the help of the statistical tool, Regression Analysis, the relation and impact of liquidity ratios on the profitability ratios has been established. We have taken ROA as a dependent variable, whereas the liquidity ratios have been taken as independent variables.

Table 2:Model Summary -ROA

Regression Statistics	
Multiple R	0.9858
R Square	0.9719
Adjusted R Square	0.9368
Standard Error	0.0004
Observations	10.0000

The above table gives the regression statistic for correlation between Return on Asset (ROA) and the Liquidity Ratios for HDFC bank. On the basis of Multiple R, there is a 98.58% probability that the two variables move in tandem with each other i.e. there is a strong correlation between the Liquidity Ratios and ROA. However, on the basis of Adjusted R square, it can be established that 93.69% of the variation in ROA can be explained by the liquidity ratios. Whereas, rest 6.31% is due to other factors like macro-economic factors, industrial norms, etc.

Table 3: ANOVA-ROA

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.73467E-05	3.46934E-06	27.6597	0.0034
Residual	4	5.01718E-07	1.25429E-07		
Total	9	1.78484E-05			

Sincethe Significance F value is 0.34% which is smaller than 5% it can be said that there is a significant relationship between ROA and Liquidity Ratios. Thus, the model is significant and ROA can be predicted on the basis of Liquidity Ratios.

Table 4: Coefficients - ROA

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.0019	0.0035	0.5414	0.6170
Credit to Deposit ratio	-0.1295	0.0272	-4.7635	0.0089
Cash and Bank Balance to Deposit ratio	-0.0177	0.0085	-2.0924	0.1046
Loan to Total Asset ratio	0.2029	0.0385	5.2693	0.0062
Total Liquid Funds to Deposit ratio	0.9021	0.1820	4.9571	0.0077
Liquid Asset to Total Asset ratio	-1.2304	0.2439	-5.0443	0.0073

On the basis of the above table, Regression Equation can be written as:
Y = 0.0019 - (0.1295*Credit to Deposit Ratio) - (0.0177*Cash and Bank Balance to Deposit Ratio +(0.2029*Loan to Total Asset Ratio) + (0.9021*Total Liquid Funds to Deposit Ratio) - (1.2304*Liquid Asset toTotal Asset Ratio)

Relationship analysis between Liquidity Ratios and ROA and Hypothesis Testing:
Credit to Deposit Ratio:
As per the above table, the coefficient value of Credit to Deposit Ratio is -0.1295. This indicates that both the variables are negatively correlated with each other i.e. with every increase in the Credit to Deposit Ratio the ROA will decrease by 0.1295 units. However, the p-value of Credit to Deposit Ratio is 0.0089 which is smaller than the significance level of 0.05. Thus, the impact of Credit to Deposit ratio on ROA is significant. Hence, we accept the Alternative Hypothesis H1 which states that Credit to Deposit Ratio has a significant relationship with ROA.
Cash and Bank Balance to Deposit Ratio:
The coefficient value of Cash and Bank Balance to Deposit Ratio is -0.0177. This indicates that both the variables are negatively correlated with each other i.e. with every increase in the Cash and Bank Balance to Deposit Ratio, the ROA will decrease by 0.0177 units. However, the p-value of Cash and Bank Balance to Deposit Ratio is 0.1046 which is greater than the significance level of 0.05. Thus, the impact of Cash and Bank

Balance to Deposit Ratio on ROA is not significant. Hence, we accept Null Hypothesis H2 which states that Cash and Bank Balance to Deposit Ratio doesn't have a significant relationship with ROA.

Loan to Total Asset Ratio:
The coefficient value of Loan to Total Asset Ratio is 0.2029. This indicates that there is a positive relationship between the two variables i.e. with an increase in the Loan to Total Asset Ratio the ROA will increase by 0.2029 units. However, the p-value of Loan to Total Asset Ratio is 0.0062 which is lower than the significance level of 0.05. Thus, the impact of Loan to Total Asset Ratio on ROA is significant. Hence, we accept the Alternative Hypothesis H3which states that Loan to Total Asset Ratio has a significant relationship with ROA.

Total Liquid Funds to Deposit Ratio:
The coefficient value of Total Liquid Funds to Deposit Ratio is 0.9021. This indicates that there is a positive relationship between the two variables i.e. with an increase in the Total Liquid Funds to Deposit Ratio the ROA will increase by 0.9021 units. However, the p-value of Loan to Total Asset Ratio is 0.0077 which is lower than the significance level of 0.05. Thus, the impact of Total Liquid Funds to Deposit Ratio on ROA is significant. Hence, we accept the Alternative Hypothesis H4 which states that Total Liquid Funds to Deposit Ratio has a significant relationship with ROA.

Liquid Asset to Total Asset Ratio:
The coefficient value of Liquid Asset to Total Asset Ratio is -1.2304. This indicates that there is a negative relationship between the two variables i.e. with an increase in the Liquid Asset to Total Asset Ratio the ROA will decrease by 1.2304 units. However, the p-value of Loan to Total Asset Ratio is 0.0073 which is lower than the significance level of 0.05. Thus, the impact of Liquid Asset to Total Asset Ratio on ROA is significant. Hence, we accept the Alternative Hypothesis H5 which states that Liquid Asset to Total Asset Ratio has a significant relationship with ROA.

4.3 Dependent Variable: Return on Equity (ROE)
With the help of the statistical tool, Regression Analysis, the relation and impact of liquidity ratios on the profitability ratios have been established. We have taken ROE as a dependent variable, whereas the liquidity ratios have been taken as independent variables.

Table 5:Model Summary - ROE

Regression Statistics	
Multiple R	0.7737
R Square	0.5986
Adjusted R Square	0.0968
Standard Error	0.0169
Observations	10

The above table gives the regression statistic for correlation between Return On Equity (ROE) and the Liquidity Ratios for HDFC bank. It can be established on the basis of the value of Multiple R that there is 77.37% probability that the two variables move in tandem with each other i.e. in the same direction. However, on the basis of Adjusted R Square it can be established that only 9.68% of variation in ROE can be explained by the Liquidity Ratios.

Table 6: ANOVA - ROE

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	0.0017	0.0003	1.1929	0.4446
Residual	4	0.0011	0.0003		
Total	9	0.0029			

The above table gives the analysis of the variance in the model for correlation between ROE and Liquidity ratios. Here, the value of significance f is 0.4446. This value is not significant as it is greater than 0.05. This value interprets that ROE cannot be predicted on the basis of the Liquidity Ratios. And thus the model is not significant.

Table 7: Coefficients - ROE

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.3414	0.1654	2.0643	0.1079
Credit to Deposit ratio	-1.9203	1.3012	-1.4758	0.2140
Cash and Bank Balance to Deposit ratio	-0.2134	0.4056	-0.5260	0.6267
Loan to Total Asset ratio	2.3928	1.8427	1.2985	0.2639
Total Liquid Funds to Deposit ratio	15.5867	8.7088	1.7898	0.1480
Liquid Asset to Total Asset ratio	-21.3980	11.6728	-1.8332	0.1407

On the basis of the above table, Regression Equation can be written as:
ROE = 0.3414 - (1.9203 * Credit to deposit ratio) - (0.2134 * Cash and Bank Balance to Depositratio) +(2.3928 * Loan to Total Asset ratio) + (15.5867 * Total Liquid Funds to Depositratio) - (21.3980 * LiquidAsset to Total Asset ratio)

Relationship analysis between Liquidity Ratios and ROE and Hypothesis Testing:
Credit to Deposit Ratio:
As obtained from the table , the co-efficient for Credit to Deposit ratio is -1.9203. This value indicates that with every unit increase in the Credit to deposit ratio, the ROE will decrease by 1.9203 units, thus establishing a negative relationship. However, it must be noted that the p-value is 0.2140 which is higher than 0.05. Thus, the impact of Credit to Deposit ratio on ROE is not significant. Hence, we accept the Null Hypothesis H6 which states that Credit to Deposit ratio has no significant relationship with ROE.
Cash and Bank Balance to Deposit ratio:
The co-efficient for Cash and Bank Balance to Deposit ratio is -0.2134. This value indicated that with every unit increase in the Cash and Bank Balance to Deposit ratio, the ROE for HDFC Bank will decrease by 0.2134 units, thus establishing an inverse relationship. However, the p-value is 0.6267, which is higher than 0.05. Hence, it can be concluded that the impact of this ratio on ROE is not significant. Therefore, we accept the Null Hypothesis H7 which states that Cash and Bank Balance to Deposit ratio has a no significant relationship with ROE.
Loan to Total Asset ratio:
It can be obtained from the table that the co-efficient for Loan to Total Asset ratio is 2.3928 indicating a positive relationship between Loan to Asset ratio and ROE. With every unit increase in the Loan to Asset ratio, the ROE will increase by 2.3928 units. However, p-value here 0.2639 shows that the relationship between them is not significant as it is more than 0.05. Therefore, we accept the Null Hypothesis H8 which states that Loan and Total Asset ratio has no significant relationship with ROE.
Total Liquid Funds to Deposit ratio:
As given in the table, the co-efficient for Total Liquid Funds to Deposit ratio is 15.5867 which means that there is a positive relationship between Total Liquid Funds to Deposit ratio and ROE. With every unit increase in Total Liquid Funds to Deposit ratio, the ROE for HDFC bank increases by 15.5867 units. Although, the p-value here is 0.1480 which is higher than 0.05. This means that Total Liquid Funds to Deposit ratio has no significant impact on the ROE. Hence, we accept the Null Hypothesis H9 which states that Total Liquid Funds to Deposit ratio has no significant relationship with ROE.
Liquid Asset to Total Asset ratio:
It can be obtained from the table that the co-efficient of Liquid Asset to Total Asset is -21.3980. This means that with one unit increase in Liquid Asset to Total Asset ratio, the ROE decreases by 21.3980 units, indicating a negative relationship between the two variables. However, the p-value for this liquidity ratio is 0.1407 which is higher than 0.05. This means that Liquid Asset to Total Asset ratio has no significant impact on ROE. Thus, we accept the Null Hypothesis H10 which states that Liquid Asset to Total Asset ratio has no significant relationship with ROE.

4.4 Dependent Variable: Net Interest Margin (NIM)
Taking NIM as the dependent variable and liquidity ratios as independent variables, all independent variables are regressed with the NIM with the help of regression analysis. Following are the outputs that have been obtained.

Table 8: Model Summary - NIM

Regression Statistics	
Multiple R	0.8771
R Square	0.7692
Adjusted R Square	0.4808
Standard Error	0.0006
Observations	10.0000

The above table gives the regression statistic for correlation between Net Interest Margin (NIM) and the Liquidity Ratios for HDFC bank. On the basis of Multiple R, there is an 87.71% probability that the two variables move in tandem with each other i.e. there is a strong correlation between the Liquidity Ratios and NIM. However, on the basis of Adjusted R square, it can be established that 48.08% of the variation in NIM can be explained by the liquidity ratios. Whereas, rest 51.92% is due to other factors.

Table 9: ANOVA - NIM

ANOVA

	df	SS	MS	F	Significance F
Regression	5	4.92312E-06	9.84624E-07	2.6668	0.18
Residual	4	1.47688E-06	3.6922E-07		
Total	9	6.4E-06			

Since the Significance F value is 18% which is greater than 5% it can be said that there isn't a significant relationship between NIM and Liquidity Ratios. Thus, the model isn't significant and NIM can't be predicted on the basis of Liquidity Ratios.

Table 10: Coefficients - NIM

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.0516	0.0059	8.6983	0.0010
Credit to Deposit ratio	-0.1134	0.0467	-2.4311	0.0719
Cash and Bank Balance to Deposit ratio	-0.0281	0.0145	-1.9311	0.1257
Loan to Total Asset ratio	0.1434	0.0661	2.1703	0.0958
Total Liquid Funds to Deposit ratio	0.7061	0.3122	2.2613	0.0866
Liquid Asset to Total Asset ratio	-0.9429	0.4185	-2.2529	0.0874

On the basis of the above table, Regression Equation can be written as:
Y = 0.0516 - (0.1134*Credit to Deposit Ratio) - (0.0281*Cash and Bank Balance to Deposit Ratio +(0.1434*Loan to Total Asset Ratio) + (0.7061*Total Liquid Funds to Deposit Ratio)-(0.9429*Liquid Asset to Total Asset Ratio)

Relationship analysis between Liquidity Ratios and ROA and Hypothesis Testing:
Credit to Deposit Ratio:
As per the above table, the coefficient value of Credit to Deposit Ratio is -0.1134. This indicates that both the variables are negatively correlated with each other i.e. with every increase in the Credit to Deposit Ratio the NIM will decrease by 0.1134 units. However, the p-value of Credit to Deposit Ratio is 0.0719 which is greater than the significance level of 0.05. Thus, the impact of Credit to Deposit ratio on NIM is not significant. Hence, we accept Null Hypothesis H11 which states that Credit to Deposit Ratio doesn't have a significant relationship with NIM.

Cash and Bank Balance to Deposit Ratio:
The coefficient value of Cash and Bank Balance to Deposit Ratio is -0.0281. This indicates that both the variables are negatively correlated with each other i.e. with every increase in the Cash and Bank Balance to Deposit Ratio the NIM will decrease by 0.0281 units. However, the p-value of Cash and Bank Balance to Deposit Ratio is 0.1257 which is greater than the significance level of 0.05. Thus, the impact of Cash and Bank

Balance to Deposit Ratio on NIM is not significant. Hence, we accept Null Hypothesis H12 which states that Cash and Bank Balance to Deposit Ratio have a significant relationship with NIM.

Loan to Total Asset Ratio:
The coefficient value of Cash and Bank Balance to Deposit Ratio is 0.1434. This indicates that both the variables are positively correlated with each other i.e. with every increase in the Loan to Total Asset Ratio the NIM will increase by 0.1434 units. However, the p-value of Loan to Total Asset Ratio is 0.0958 which is greater than the significance level of 0.05. Thus, the impact of Loan to Total Asset Ratio on NIM is not significant. Hence, we accept Null Hypothesis H13 which states that Loan to Total Asset Ratio doesn't have a significant relationship with NIM.

Total Liquid Funds to Deposit Ratio:
The coefficient value of Total Liquid Funds to Deposit Ratio is 0.7061. This indicates that there is a positive relationship between the two variables i.e. with an increase in the Total Liquid Funds to Deposit Ratio the NIM will increase by 0.7061 units. However, the p-value of Loan to Total Asset Ratio is 0.0866 which is greater than the significance level of 0.05. Thus, the impact of Total Liquid Funds to Deposit Ratio on NIM is not significant. Hence, we accept Null Hypothesis H14 which states that Total Liquid Funds to Deposit Ratio doesn't have a significant relationship with NIM.

Liquid Asset to Total Asset Ratio:
The coefficient value of Liquid Asset to Total Asset Ratio is -0.9429. This indicates that there is a negative relationship between the two variables i.e. with an increase in the Liquid Asset to Total Asset Ratio the NIM will decrease by 0.9429 units. However, the p-value of Loan to Total Asset Ratio is 0.0874 which is greater than the significance level of 0.05. Thus, the impact of Liquid Asset to Total Asset Ratio on NIM is not significant. Hence, we accept the Null Hypothesis H15 which states that Liquid Asset to Total Asset Ratio doesn't have a significant relationship with NIM.

V.   FINDINGS AND INTERPRETATION

This study investigated the impact of liquidity, which was measured by several balance sheet ratios like Credit to Deposit Ratio, Cash and Bank Balance to Deposit Ratio, Loan to Total Assets Ratio, Total Liquid Fund to Deposit Ratio and Liquid Assets to Total Assets Ratio, on the profitability of HDFC Bank, measured by Return on Asset (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). This study thereby intends to contribute to the overall literature through a robust assessment of liquidity on bank's profitability.

In order to do so, balance sheet data of HDFC Bank for the period of 2010-2019 was included, resulting in 10 observations per ratio. They were further studied and analysed using Regression statistical technique. The results of this study showed that Credit to Deposit Ratio had a statistically significant relation with Return on Asset (ROA) but not with Return on Equity (ROE) and Net Interest Margin (NIM). Likewise, Loan to Total Asset Ratio, Total Liquid Funds to Deposit Ratio and Liquid Asset to Total Asset Ratio had a statistically significant relation with Return on Asset (ROA) but not with Return on Equity (ROE) and Net Interest Margin (NIM). Whereas, Cash and Bank Balance to Deposit Ratio had no statistically significant relationship with any of the profitability ratios i.e. Return on Asset (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). Thus the overall results indicate that liquidity has a significant impact on Return on Asset (ROA) expect for the Cash and Bank Balance to Deposit Ratio. However, Liquidity isn't significantly correlated with Return on Equity (ROE) and Net Interest Margin (NIM). Thus, based on the research findings it can be concluded that for HDFC Bank, Liquidity Ratios had no effect on Profitability. Thereby indicating that the profitability of HDFC Bank is not predominantly determined by the liquidity ratios: Credit to Deposit Ratio, Cash and Bank Balance to Deposit Ratio, Loan to Total Assets Ratio, Total Liquid Fund to Deposit Ratio and Liquid Assets to Total Assets Ratio.

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