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Liquidity regulation and bank lending in nepalese commercial bank

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Abstract
Liquidity Regulation refers to a monetary policy tool used by central banks to regulate the amount of liquidity (the availability of funds) in the banking system. Bank liquidity shortages during the global financial crisis of 2007–2009 led to the introduction of liquidity regulations, the impact of which has attracted the attention of academics and policymakers. Commercial bank performs the act of financial intermediary that gather the money from excess sectors in the form of deposits and lend it to various sectors of economy. Lending is one of the major functions of banking institution. The main objective of the study is to examine the impact of liquidity regulation on bank lending of Nepalese Commercial Bank. The study is based on quantitative nature of secondary data of 10 commercial banks taken as a sample by following simple random sampling method from 2011 to 2020 with 100 observations. Here the dependent variable is bank lending; total loan, bank deposit to total assets and customer deposit to total asset. The independent variable is liquidity regulation; short term loan to total asset, cash reserve ratio and credit deposit ratio. Results of the study have revealed that there is significant relationship between liquidity regulation and bank lending. The findings revealed that credit deposit ratio and cash reserve ratio have the more impact on lending than short term loan to total assets.

Keywords: liquidity regulation, lending, profitability, monetary policy

Introduction

The financial crisis of 2007-2009 prompted extensive intervention from governments and regulators to provide financial support to banks that were struggling to meet their short-term obligations. This event has since sparked significant interest among academics, as policymakers have introduced new regulations to enhance the liquidity of banks and reduce their vulnerability to liquidity risks. The global financial crisis emphasized the significance of bank liquidity in maintaining stability and avoiding systemic risk. (Calomiris *et al*., 2014; De Nicolo, ` 2016; Chiaramonte and Casu, 2017; Chiaramonte, 2018; Bouwman, 2019) [12, 11]. Hence, various measures have been implemented by policymakers to enhance bank liquidity, including stricter capital and liquidity requirements, stress testing, and improved transparency in funding markets. Commercial banks play a crucial role in the economy by serving as intermediaries between surplus and deficit sectors. They accept deposits from individuals and businesses, and invest these funds in various productive areas of the economy.

The introduction of liquidity rules is likely to cause banks to change the composition of assets and/or liabilities. Banks are likely to reduce illiquid assets and/or increase liquid assets and stable funding sources with resultant implications for bank lending. Prior research documents a positive relationship between liquidity and bank lending, albeit these studies typically investigate this issue. De Nicolo (2016) provided an extensive discussion and review of the literature regarding the rationale and benefits and costs of liquidity regulation through the prism of monetary policy (Kashyap and Stein, 2000; Gambacorta, 2005) [20, 18]. Bank lending has key role in promoting economic growth. However, there is a risk of increasing inflation by irrational bank lending. On the one hand, excessive bank lending to especially unproductive and speculative sector leads to the unnecessary increase in money supply and inflation. On the other hand, very low and restrictive bank lending leads to curtail in production and thus gives rises to increase in inflation.

So, the purpose of this study is to identify the impact of liquidity regulation in bank lending of Nepalese commercial bank.

The major objective of this study is to analyse the impact of liquidity regulation and bank lending of Nepalese commercial bank.

- To examine the relationship between liquidity and lending behaviour of Nepalese commercial banks.
- To access the change on bank lending due to the liquidity regulation of commercial banks.

Review of Literature

Empirical Review

Liquidity rules introduced following the financial crisis under Basel III are designed to ensure that banks hold enough liquidity to absorb unforeseen shocks. While there is a paucity of research regarding the impact of liquidity regulations, valuable insights are provided by general literature on bank liquidity.

Webb (2000) [50] argued that if banks have access to sufficient funding, the implementation of liquidity regulation should not constrain lending. That is, banks use various strategies (including capital accumulation and equity issuance, money market borrowing, offering higher interest rates on deposits) to secure additional funds.

Kashyap and Stein (2000) [20] documented evidence supporting the "lending channel" hypothesis, which suggests that monetary policy affects the real economy through its impact on bank lending. The authors concluded that more liquid banks are more responsive to changes in monetary policy, and therefore play a key role in transmitting the policy to the real economy through the lending channel.

Cornett *et al*. (2011) [13] found that high levels of funding liquidity might reflect needs to meet higher liquidity requirements. Maintaining sufficient liquidity helps limit risks of insolvency and lack of liquidity, so banks might choose to restrict lending activities.

Acharya and Naqvi (2012) [12] suggested that large deposits enhance funding liquidity, allowing managers to reduce lending interest rates in order to raise loan volumes and market shares. If managers are rewarded based on loan growth rates or loan volumes, a positive link between funding liquidity and loan growth is anticipated. Furthermore, short-term bank managers might ignore long-term consequences of such lending behaviour. Importantly, this is likely to happen in countries where banks act as the prime financing channel that spurs the economy.

Dim and Wiart's (2014) used a panel error correction framework to examine how banks adjust their balance sheets to meet the Dutch Liquidity Ratio following liquidity shocks. They find that when the gap between a bank's actual liquidity ratio and its required ratio is below its long-term average, banks adjust their balance sheets by increasing the share of stable forms of funding, while the response of liquid assets is insignificant. This result is broadly in line with our study although we find banks adjusted the composition of assets in addition to the composition of liabilities following a tightening of liquidity regulation.

Bhattarai (2016) [7] has assessed the lending behaviour of Nepalese commercial banks. The study argues that Nepalese banks are more willing to extend credit as they expand in terms of their total assets. However, the study argues that cash reserve requirement ratio, liquidity and investment portfolio decrease the banks' intention and penchant to extend further credit to customers.

De Young and Kang (2016) [16] examined liquidity management of US banks following liquidity shocks. They find that small banks tend to adjust the composition of assets and liabilities, which temporarily depresses profitability, but find little effect on larger banks.

Banerjee and Mio (2018) [6] found no change in bank lending following the introduction of liquidity regulation in the UK banking industry. A small, but growing literature using dynamic structural models offers differing assessments regarding the impact of liquidity rules on bank behaviour and real economic activity. These assessments range from a small and negative (Macroeconomic Assessment Group, 2010; Angelini *et al*., 2011) to a negative and significant impact of liquidity requirements on bank lending and real economic activity.

Agenor (2019) presented a theoretical model where liquidity requirements enhance financial stability, thus increasing confidence among depositors and acting as an incentive to save. This increased saving has a positive effect on banks' ability to lend.

Dahir *et al*. (2019) [15] found a negative relationship between funding liquidity and lending for banks in BRICS countries.

Reinhardt *et al*. (2020) [45] offered empirical evidence for the UK of a moderating effect of deposit funding on the impact on cross-border lending following the introduction of liquidity regulations. The authors assert that a dependence on deposit funding could result in a cross-border expansion in lending, despite more onerous liquidity requirements.

Tran and McMillan (2020) used a sample of U.S. bank holding from 2000 to 2017, and shows the negative effects of funding liquidity on lending in the U.S does not find any evidence of the relation between lending and funding liquidity after the global crisis. A speculative explanation for the insignificant relation-ship between lending and funding liquidity after the crisis is the offsetting effect of the precautionary behavior documented before the crisis and the increased moral hazard induced by the government intervention after the crisis.

Ananou *et al* (2021) [5] investigated the impact of bank liquidity regulation on lending using as a setting, the introduction of the so-called Liquidity Balance Rule (LBR) implemented in the Netherlands in 2003. Using a difference-in-differences approach and propensity score matching techniques (to form an appropriate control group of banks to act as a benchmark for our treated banks), their result indicate that following the introduction of the LBR, Dutch banks increased lending relative to unaffected counterparts.

Research Gap

The impact of liquidity regulation on the financial sector and the real economy is a topic of much debate in the academic and policy-making spheres. Despite numerous studies that have attempted to analyze this relationship using dynamic structural models, the results are inconsistent and often contradictory. Some studies have found a positive relationship between liquidity and bank lending, where liquidity requirements enhance financial stability and increase depositor confidence, leading to an increase in savings and the ability of banks to lend (Kashyap and Stein, 2000; Gambacorta, 2005; Agenor, 2019) [20, 18].On the other hand, other studies have found no change in bank lending following the introduction of liquidity regulation (Baerjee and Mio, 2018) or even a negative impact on bank lending, efficiency, and welfare (De Nicolo *et al*., 2014; Covas and Driscoll, 2014) [14].

This discrepancy in the results presents a major problem as it raises questions about the effectiveness of liquidity regulation in promoting financial stability and economic growth. It is essential to have a clear understanding of the relationship between liquidity regulation and bank lending behavior in order to inform policy decisions that will have real-world impacts on the financial sector and the economy. Therefore, further research is needed to clarify the relationship between liquidity regulation and bank lending behaviour and its impact on the real economy.

Research Methodology

Research Design

Research Design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variances. Basically, this study based on descriptive research design and cause and effect research design for fact finding through analysis of data to control variances.

Population and Sample, and Sampling Design

As of July, 2022 (Licensed by NRB) there are 26 commercial banks operating in Nepal so, all the commercial banks operating in Nepal are consider as the population. Here all 26 commercial banks are population.

A sample is a collection of items or elements from a population. Hence, a sample is only a portion of subset of the population. Out of 26 commercial banks ten banks are taken as a sample by following simple random sampling method.

Nature and Sources of Data
Quantitative nature of secondary data has been used for conducting the study The main sources of data include Bank Supervision Reports published by Nepal Rastra Bank and annual reports of the selected commercial banks. The required other information has obtained from journals, articles, related websites, published and unpublished thesis and dissertations.

Data Analysis
Descriptive and inferential statistics tools are used in this study. The descriptive statistics contains mean and standard deviation values of variables used to explain sample firms' characteristics. The correlation analysis is used to determine the relationship between the dependent and independent factors. The regression analysis is used to determine the independent variable's influence over the dependent variable solely and combined with other variables.

Hypothesis of the Study

H1: The liquidity regulation leads to significant change in bank lending. (Kashyap and Stein, 2000; Gambacorta, 2005; De Nicolo ` *et al*. (2014) [20]

H2: The liquidity regulation leads to an increase in short term bank lending. (Bonner and Eijffinger, 2016)

H3: The liquidity regulation leads to an increase in bank deposits. (Webb, 2000; Vives, 2014) [50].

Theoretical Framework
The theoretical framework frame work of the study is represented below:

Liquidity Regulation
Short term loan to total assets (STLTA)
Cash Reserve Ratio (CRR)
Credit to deposit Ratio (CDR)

→

Bank Lending
Bank deposit to total assets (BDTA)
Natural log of total loan (NL oan)
Customer deposit to Total Assets (CDTA)

Source: Adopted from Ananou *et al*. (2021) [5]

Fig 1: Theoretical Framework

Model
This study has estimated regression model to analyze the relationship between bank lending and liquidity regulations.

Model 1
$CDTA=\beta0+\beta1STLTA+\beta2CDR+\beta3CRR+e$……...1

Model 2
$Nloan=\beta0+\beta1STLTA+\beta2CDR+\beta3CRR+e$……...2

Model 3
$BDTA=\beta0+\beta1STLTA+\beta2CDR+\beta3CRR+e$……...3

Were,
CDTA= Customer deposit to total asset
Nloan =Natural logarithm of loan
BDTA = Bank deposit to total asset
STLTA = Short term loan to total asset
CDR = credit deposit ratio
CRR = cash reserve ratio
e = estimation of error term
β0= constant
β1, β2, β3 = Coefficient

Results and Analysis
Descriptive analysis of all sample banks
the descriptive - mean, standard deviation, minimum and maximum values of variables associated sample bank. Firstly, customer deposit has the mean value of 84872.597with standard deviation of 54496. 161.The minimum value is 15983 and maximum value 287024.8. Secondly, the variable total asset has minimum value of 18495 and maximum value of 346147.5 leading to the average of 103889 with standard deviation of 71225.23. Likewise, the variable total loan has mean value of 797050.7 with standard deviation of 7264197 which range from 10884 to 72711077. Similarly, bank deposit has the mean value of 40662.58 with standard deviation of 308928.1 which range from 1171 to 3098327. Lastly, the variable short-term loan range from 15875.13 to 233080.9 having an average value of 70718.49 with standard deviation 43176.99.

Pearson's correlation test

Table 1: Correlation matrix for dependent and independent variables

CDTA	STLTA	CDR	CRR	Nloan	BDTA	
1.0000	0.0676	-0.6793	0.1756	-0.6783	0.2091	CDTA
	1.0000	-0.0192	0.1356	-0.0147	-0.0402	STLTA
		1.0000	-.0634	0.5228	-0.5472	CDR
			1.0000	-0.1076	0.1724	CRR
				1.0000	-0.3052	Nloan
					1.0000	BDTA

This table is a correlation matrix, which shows the correlation coefficients between different variables. The correlation coefficient is a statistical measure that ranges from -1 to 1, and it indicates the strength and direction of the linear relationship between two variables. The diagonal elements in the matrix are all equal to 1, which indicates that each variable is perfectly correlated with itself.
Here, The result shows that customer deposit to total asset is positively correlated with short term loan to total asset(0.0676), cash reserve ratio(0.1756) and bank deposit to total asset(0.2091) but negatively correlated with credit deposit ratio(-0.6793) and nloan(-0.6783) It means higher the short term loan to total asset, bank deposit to total asset and cash reserve ratio higher would be customer deposit to total asset but higher the credit deposit ratio and nloan lower would be customer deposit to total asset.The result also indicates that short term loan to total asset is positively correlated with cash reserve ratio (0.1356) but negatively correlated with credit deposit ratio (-0.0192), nloan(-0.0147) and bank deposit to total asset(-0.0402).Similarly, credit deposit ratio is positively correlated with nloan(0.5228) and

negatively correlated with cash reserve ratio(-0.0634) and bank deposit to total asset(-0.5472). Cash reserve ratio is positively correlated with bank deposit to total asset (0.1724) and negatively correlated with nloan(-0.1076). It indicates that higher the bank deposit to total asset higher would be cash reserve ratio, whereas higher the nloan lower would be cash reserve ratio. And total loan is negatively correlated with bank deposit to total asset (-0.3052). It indicates that higher the bank deposit to total asset lower would be nloan.

Multiple Regression Analysis

Table 2: Regression of short term loan to total asset, credit deposit ratio and cash reserve ratio on customer deposit to total asset.

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Const	121.706	4.73938	25.68	<0.0001
STLTA	0.0127938	0.0253829	0.5040	0.6154
CDR	−0.486550	0.0535018	−9.094	<0.0001
CRR	0.0655723	0.0381226	1.720	0.0886

***, **, * Significant at 1 %, 5% and 10% level respectively.
Source: Author's calculation

Regression equation showing the relation between all independent variable and dependent variable:

CDTA=β0+β1STLTA+β2CDR+β3CRR+e……1

CDTA=121.706+0.0127938STLTA−0.486550CDR+0.0655723CRR

From table it indicates that the credit deposit ratio variable has a p-value of <0.0001 and a large absolute t-ratio of -9.094, indicating the conclusion that this variable has a significant negative effect on the dependent variable. On the other hand, the cash reserve ratio variable has a p-value of 0.0886, indicating weak support for the conclusion that this variable has a significant effect on the response variable. Whereas, short term loan to total asset has its p-value is not less than 0.05 (0.6154) therefore it has no significant effect on dependent variable.
Here, the value of R-squared is 0.480404 and adjusted R-squared is 0.464166 which shows that the 46.4%of variation is explained by independent variables in dependent. The F-statistic, with a p-value of 0.0000, shows that the overall model is significant.

Table 3: Regression of short-term loan to total asset, credit deposit ratio and cash reserve ratio on total loan. Dependent variable: Nloan

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
Const	2.82312	0.350064	8.065	<0.0001
STLTA	0.000117803	0.00187485	0.06283	0.9500
CDR	0.0235729	0.00395179	5.965	<0.0001
CRR	−0.00242541	0.00281584	−0.8613	0.3912

Source: Author's calculation
***, **, * Significant at 1%, 5% and 10% level respectively

Regression equation showing the relation between all independent variable and dependent variable:

Nloan=β0+β1STLTA+β2CDR+β3CRR+e……2

Nloan=2.82312+0.000117803STLTA+0.0235729CDR−0.00242541CRR

Result given in table shows that in model 2 coefficient of short-term loan to total asset, cash reserve ratio have no significant effect on natural logarithm of loan as their p-value are greater than 0.05(0.9500 and 0.3912). This indicates that they both have no significant effect on loan. The coefficient of credit deposit ratio is positively and significantly related with natural logarithm of loan. This indicates that they both move on same direction i.e as credit deposit increases total loan also increases.
Here, the value of R-squared is 0.279 and adjusted R-squared is 0.256 which shows that the 25.6% of the sample variation in dependent variable is explained by independent variables. The F-statistic, with a p-value of 0.0000, shows that the overall model is significant.

Table 4: Regression of short-term loan to total asset, credit deposit ratio and cash reserve ratio on bank deposit to total assets. Dependent variable: BDTA

	Coefficient	**Std. Error**	**t-ratio**	**p-value**
Const	36.6025	4.40494	8.309	<0.0001
STLTA	−0.0196321	0.0235918	−0.8322	0.4074
CDR	−0.318701	0.0497264	−6.409	<0.0001
CRR	0.0616747	0.0354325	1.741	0.0850
Mean dependent var	10.20400	S.D. dependent var		3.988345
Sum squared resid	1065.562	S.E. of regression		3.331607
R-squared	0.323359	Adjusted R-squared		0.302214
F (3, 96)	15.29246	P-value(F)		0.000000

Source: Author's calculation
***, **, * Significant at 1 %, 5% and 10% level respectively

Regression equation showing the relation between all independent variable and dependent variable:

BDTA= β0+β1STLTA+β2CDR+β3CRR+e…….3

BDTA=36.6025−0.0196321STLTA−0.318701CDR+0.0616747CRR

From the table 3 it appears that the variable cash reserve ratio is positively and significantly related with bank deposit to total asset. This indicates higher the cash reserve ratio increases bank deposit to total asset. The variable credit deposit ratio and bank deposit to total asset are significant at 1% level of significance. The coefficient of variable is negative indicating that increase in credit deposit ratio decreases the bank deposit to total asset. The variable short-term loan to total asset has no significant effect on bank deposit to total asset as its p-value is greater than 0.05 (0.4074).
The R-squared and adjusted R-squared values indicate the proportion of the variation in the dependent variable that is explained by the independent variables. The value of R-squared is 0.323359 and adjusted R-squared is 0.302214 which suggest that the independent variables explain 30.22% of the variation in the dependent variable. The F-statistic, with a p-value of 0.0000, shows that the overall model is significant.

Table 5: hypothesis test result

Hypothesis	p-value	Accept or reject
H1: The liquidity regulation leads to significant Change in bank lending.	0.000	Reject Null Value
H2: The liquidity regulation leads to an increase In short term bank lending.	0.000	Reject Null Value
H3: The liquidity regulation leads to an increase in bank deposits.	0.000	Reject Null Value

Here, the result indicates that the p-value of all variables is less than 0.05. Therefore, null hypothesis is rejected.

Discussion

The liquidity requirement leads to significant change in bank lending. This result is consistent to the result of Alper *et al*., (2018). However, this result contradicts to the findings of Baerjee and Mio (2018). Similarly, There is positive relationship between liquidity and bank lending (Kashyap and Stein, 2000; Gambacorta, 2005) [20]. Agenor (2019) presented a theoretical model where liquidity requirements enhance financial stability, thus increasing confidence among depositors and acting as an incentive to save. This increased saving has positive effect on bank's ability to lend. Nevertheless Baerjee and Mio (2018) found no change in bank lending following the introduction of liquidity regulation in UK banking industry. De Nicolo *et al*. (2014) consider a dynamic partial equilibrium model, in which bank transform insured deposits and short term collateralized debt into illiquid assets. The results suggest that the introduction of liquidity requirements reduces bank lending, efficiency and welfare. Covas and Driscoll (2014) [14] developed similar model in order to assess the macro economic impact of bank liquidity requirements. The authors find out that the introduction of liquidity standards leads to a decrease in bank lending.

Conclusion and Implications

This study examines the impact of liquidity regulations on bank lending in Nepalese commercial banks using secondary data from 10 commercial banks from 2011 to 2020.In conclusion, this study has found that liquidity regulations have a significant impact on bank lending in Nepalese commercial banks. The cash reserve ratio has a positive and significant relationship with bank deposit to total assets while credit deposit ratio has a negative and significant relationship with bank deposit to total assets. The short term loan to total assets ratio has no significant effect on bank deposit to total assets. The credit deposit ratio has a positive and significant effect on the natural logarithm of loans while cash reserve ratio has a positive and short term loan to total assets has no effect. In terms of customer deposit to total assets, the credit deposit ratio has a negative effect and cash reserve ratio has a positive effect, while short term loan to total assets has no effect. The results suggest that the central bank may focus more on controlling the credit deposit ratio and cash reserve ratio for ensuring stability in the banking sector.

This study has provided valuable insights into the effect of liquidity regulations on bank lending. The results suggest that further research is needed to deepen the understanding of bank lending behaviour and its determining factors. Future studies could consider larger sample sizes, more in-depth econometric analysis, and the inclusion of other financial and non-financial institutions. By considering additional variables such as interest rate, inflation rate, exchange rate, and economic growth, a more comprehensive understanding of bank lending can be achieved. This research is important for various stakeholders, including bank management, regulators, the central bank, depositors, borrowers, the government, bank owners, shareholders, and others. It will help inform better decision making and contribute to the stability and growth of the financial sector.

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