THE IMPACT OF LIQUIDITY RISK ON PERFORMANCE OF COMMERCIAL BANKS IN NEPAL

A Research dissertation submitted to

Kathmandu University School of Management

in partial fulfillment of the requirements for the

Degree of Master of Philosophy (MPhil) in Management

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DECLARATION

I hereby declare that this research work entitled *The Impact of Liquidity Risk on Performance of Commercial Banks in Nepal* embodies the result of an original research work I carried out in partial fulfillment of the requirements for the degree of Master of Philosophy (MPhil) in Management of Kathmandu University and that this dissertation has not been submitted for candidature for any other degree.

.....

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RECOMMENDATION

This is to certify that Mr. Mijash Humagain has completed his research work on *The Impact of Liquidity Risk on Performance of Commercial Banks in Nepal* under our supervision and that his research dissertation embodies the result of his investigation conducted during the period he worked as an M.Phil. Candidate of the School of Management. The dissertation is of the standard expected of a candidate for the partial fulfilment of the requirements for the degree of M.Phil. in Management and has been prepared in the prescribed format of the School of Management. The dissertation is forwarded for evaluation

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APPROVAL

We have conducted the viva-voce examination of the dissertation *The Impact of Liquidity Risk on Performance of Commercial Banks in Nepal* by Mijash Humagain and found the dissertation to be original work of the candidate and written according to the prescribed format of the School of Management. We approve the dissertation as the partial fulfillment of the requirements for the degree of Master of Philosophy (MPhil) in Management.

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ABSTRACT

Performance of commercial banks is a subject of concern to all the stakeholders. Liquidity risk and performance are considered to be two important concepts globally. The purpose of this study is to examine the impact of liquidity risk on performance of commercial banks in Nepal. This study found that with decrease in liquidity risk the performance of commercial bank also decreases.

This study used accounting based measure to evaluate the performance of commercial banks which include Return on Asset (ROA), Return on Equity (ROE) and Net Interest Margin (NIM) and Funding Gap Ratio (FGAPR), Liquidity after Loan to Deposit Ratio (LALDR) and Liquid Asset to Total Deposit (LATD) as a measure of liquidity risk. This study employed annual data from 2004 to 2019 and used fixed effect regression model to evaluate the impact of liquidity risk on performance. This study found that Funding Gap Ratio has negative impact on ROA whereas it has no impact with other performance measures. Similarly, Liquidity after Loan to Deposit Ratio and Liquid Asset to Total Deposit has negative impact on ROA and NIM. The study found no impact of liquidity risk measures on performance measured by ROE. This leads to conclusion that with decrease in liquidity risk performance of commercial banks in Nepal decreases.

Keywords: funding gap ratio, performance, fixed effect, panel regression

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ABBREVIATIONS

ASF	Available Stable Funding
BFIs	Bank and Financial Institutions
ECB	European Central Bank
EVA	Economic Value Added
FGAPR	Funding Gap Ratio
GDP	Gross Domestic Product
IBR	Inter Bank Rate
IMF	International Monetary Fund
LALDR	Liquidity after Loan to deposit Ratio
LATD	Liquid Asset to Total Deposit
LCR	Liquidity Coverage Ratio
LLP	Loan Loss Provision
NPL	Non-performing Loan
NSFR	Net Stable Funding Ratio
ROAA	Return on Average Asset
ROAE	Return on Average Equity
RAROC	Risk Adjusted Return on Capital
ROA	Return on Assets
ROE	Returun on Equity
RSF	Required Stable Funding
SLF	Standing Liquidity Facility
SLR	Statutory Liquidity Ratio
TOT	Trade off Theory

NIM	Net Interest Margin
NRB	Nepal Rastra Bank
OLS	Ordinary Least Square
VIF	Variance Inflation Factor

CHAPTER I

INTRODUCTION

Banking plays vital role in the financial system as it does so by creating liquidity and by transferring the funds from surplus units to deficit units. Since banks being public institution their health and performance is a matter of concern to various stakeholders whether it be shareholders or depositors or customers. The performance and liquidity of banks are considered to be two of the important concepts globally (Khan & Ali, 2016). Some of the theoretical models have even identified that there is interrelation between liquidity and performance of bank (Adler, 2012). In the process of intermediation, banks face a risk of liquidity quite often. The liquidity risk takes place when banks have lesser or insufficient amount of liquidity to retire its short term obligations. Further, there may exist a gap between the required financing and availability of deposits. All of these reasons offer an inquisition to diagnose on relationship of liquidity risk on performance and stability of banks and financial institutions (BFIs).

Basel committee on Banking Supervision defined "Liquidity risk as the inability of financial intermediary to finance demand in assets and to meet their obligations as they come due." From accounting prospective, liquidity risk can be defined as the probability that during certain time frame in future the banks are unable to meet their obligation with immediacy. Strahan (2010) defined liquidity risk as the inability of the firm to raise cash on short notice. A bank is liquid when it is able to meet its forecasted expenses, such as funding of deposits or making payments on borrowing by ensuring their liquid fund (Thai & Quyen, 2018).

The credit expansion and maturity transformation in the cash flows exposes banks to liquidity risk (Sekoni, 2015). Banks normally face liquidity risk when they invest significant portion of short term liabilities in long term illiquid asset (Charmler et al., 2018). Banks, therefore, are plunged between illiquidity of assets and liquidity of liabilities which may lead to insolvency as well.

Hong et al. (2014) found that liquidity risk was one of the major contributors to bank collapse after the global financial crisis of 2007-2008. They concluded that liquidity risk could lead to bank collapse through different channels. Risal and Panta (2018) stated that Nepalese banking industry was not affected by the impact of global financial crisis, however, the failure of large banks increased the concern about liquidity risk and its impact on performance and stability all around the globe.

Though insufficient liquid fund can be taken as major cause for bank failures, possessing excess liquidity has an opportunity cost of higher returns. Molyneux and Thorton (1992) concluded that when banks fear instable situation they opt to increase their liquid fund to overcome liquidity risk at the cost of lower profitability. These failures and instabilities drew attention of financial bodies across the world and many of them introduced various measures to mitigate liquidity risk. There is always a confusion in liquidity management to find a balance between liquidity risk and profitability. Various regulatory bodies advise to hold adequate level of liquidity which increases the efficiency but also affects profitability on the other (Irawan & Faturohman, 2015).

However, some literature advocates the importance of tradeoff between liquidity shock and cost of holding less profitable liquid assets (Bordeleau & Graham, 2010). Holmstrom and Tirole (1998) explained that banks hold securities that yield lower return on their asset side to minimize liquidity shock. Thus, a highly liquid BFI

has lower portion of its assets in long-term lending's and greater portion in short-term securities which can easily be liquated to overcome liquidity risk.

There is an increasing interest in the literature related to liquidity risk, its management and its impact on performance (Chen et al., 2017; Musiega et al., 2017). That is way a strong and flexible banking industry is crucial for overall economic growth and advancement. Banks particularly play crucial role on both sides of balance sheet. They create liquidity on assets side by making loans thereby enhancing credit flow and they create liquidity on liability side by providing liquidity on demand to depositors (Donaldson et al., 2015). These roles make banks more exposed to liquidity risk when long term assets and short-term liabilities are misspecified. Acharya and Pedersen (2005) argued that liquidity risk could give rise to other risks as well. So they need to be given timely attention.

Various literature has established contradictory relationship between liquidity risk and performance. Sufian and Kamarudin (2012) identified significant relationship of liquidity risk with profitability. However, Ibe (2014) reported insignificant association between these two variables. It is quite obvious that liquidity risk is a very looming and important area in banking industry. Banks and policy makers are interested to control liquidity position through various liquidity measures to avoid liquidity risk. However, holding insufficient liquid fund creates liquidity risk while holding excess liquidity may result in reduced profitability (Molyneux & Thorton, 1992). Thus, efficient liquidity risk management aids to ensure bank's capability to meet cash flow obligations thereby maintaining optimal level of profitability. In this context, it is imperative to analyze the impact of liquidity risk on performance of Nepalese commercial banks.

Problem Statement

The global financial crisis of 2007-2008 triggered a debate on liquidity risk which negatively affected the performance and led to failure of many banks. This failure had drawn the attention of banks across the globe to focus on liquidity risk and to center on long-term sustainability for better performance (Banerjee & Velamuri, 2015). Banks in Nepal are struggling to manage liquidity risk (Sapkota, 2011). The deterioration of financial performance of Vibor Development Bank in 2011 is primarily due to liquidity risk. The Vibor panic can be a case study in understanding liquidity risk and its effect on performance. Some other examples of bank failure due to liquidity problem are the liquidation of Nepal Development bank, Samjhana Finance, Gurkha Development Bank and Peoples Finance Ltd etc. although those failure maybe linked with many other aspects, the liquidity risk is a primary cause.

Nepalese banking system is characterized by excessive interest rate on lending with greater interest spread, ineffective management and insufficient resources to finance huge projects (NRB, 2013). To address the issue, NRB directed commercial banks to increase their paid up capital from 2 billion to 8 billion and encouraged the banks to undergo merger and acquisition (NRB, 2015). The fund proliferation through capital hike and Merger and Acquisition (M&A) solved the issues relating to higher interest rate and inefficiencies to fund big projects but also increased the problem of liquidity risk as banks were involved in aggressive lending to enhance their financial performance.

NRB has been issuing repos and reverse repos as a money market management tools especially to manage liquidity surplus and deficit (Risal & Karki, 2010). Further, NRB has provided Standing Liquidity Facility (SLF) for 86 times during the fiscal year 2076/77 (NRB, 2019). The issuance of repos, reverse repos and

SLF specifies the frequent funding difficulties being faced by the financial institutions in Nepal. The investment of banks has shifted towards more fragile sources of derivate market through diversification with the ultimate goal of enhancing the performance. Over the past few years, lending on off balance sheet items has increased with a motive of improving the profitability but it comes with added risk too. Chowdhury and Zaman (2018) highlighted that the volatile investments and lending increases liquidity risk. Further, NRB has instructed BFI's to compulsorily issue bonds and debentures equivalent to 25% of their paid of capital to reduce reliance on short term volatile deposits to reduce liquidity risk (NRB, 2019).

Liquidity risk makes impact on bank's income and capital and in utmost situation may result in the collapse of the bank (Central Bank of Barbados, 2008). This is because when bank's liquidity risk increases they need to rely on market to borrow fund even at higher interest rate to satisfy withdrawal demand of the depositors. Moreover, a banks further borrowing may place the bank's capital at risk thereby increasing debt to equity ratio. This increase in debt to equity ratio affects optimal capital structure of the bank and in turn the profitability.

If the banks maintain high level of liquid fund and reserves to lower their liquidity risk, they will have to bear high cost associated with maintaining these funds. Further, they mayn't lend even to prospective borrowers. This clearly creates opportunity loss and put a bank's profitability on lower side compared to other players in the industry and reduces their performance.

In context of Nepal, with increase in liquidity risk, has the performance of commercial banks been increased or decreased. Conversely, with decrease in liquidity risk, has the performance been enhanced or deteriorated. Therefore, understanding the

relationship of liquidity risk and performance of Nepalese commercial banks in this context is of paramount importance.

Research Question

Does liquidity risk affect performance of commercial banks in Nepal?

Objective of the Study

The current study will examine the impact of liquidity risk on performance based on the published financial statement of the commercial banks of Nepal. More specifically the objective of the study can be outlined as under:

- To assess the impact of liquidity risk on return of banks.

Significance of the Study

Bank is a public entity. Its performance is of deep concern to all the stakeholders. Depositors want a stable bank that could safeguard and value their hardly earned money. Business houses and credit clients want to keep relation with highly performing banks that provide low rates and charges minimum amount on their loans. Management and staffs wants to work with highly performing banks to get better monetary value and reward for their hard work. Shareholders are also keen to know about the return on their investment who expect the share price to increase through better performance. Banks themselves need to prove their stakeholders and they need to survive in this competitive industry through better performance. Finally, the regulators are eager to hear the better performance of BFI's which could create more stable banking and contribute to the economic development of the nation.

Therefore, understanding the relation between banks' liquidity risk and its influence on performance is of high importance because it provides better intuition for banks to carefully consider their liquidity position to enhance their performance.

Further, the study will provide new insight to the bank regulators and policy makers to emphasis on liquidity risk management aimed at creating more stable BFI's.

Organization of the Study

This study has been divided into five different chapters comprising introduction, literature review, and research methodology, analysis of results and findings discussions. The coverage of each chapters are as below:

Chapter – I has covered the background of the study, statement of the problem, research question, objectives of the study, significance of the study and organization of the report. Chapter – II has covered review of literature about liquidity risk, financial performance, relationship between liquidity risk and performance, and other control variables used in the study. Conceptual framework has been formulated at the end of the chapter.

Chapter – III has covered research approach, research design, research hypotheses, variables ad their operationalization, unit of analysis, population and sample design, instrumentation, and data collection and analysis procedure. Chapter – IV has covered analysis of data, descriptive statistics, and result of various diagnostics tests, regression result, and robustness check. Chapter – V has covered the summary of findings, discussions, implications and critique of the study.

CHAPTER II

LITERATURE REVIEW

This literature review attempts to justify the theoretical underpinning, empirical evidence and need of assessing the impact of liquidity risk on bank performance. This chapter focuses on the theoretical motivation, empirical support and methodological review which are essential to derive relation between liquidity risk and performance of commercial banks in Nepal. It also helps to ascertain the applicable research gap and provides the conceptual framework based on the review. The first part deals with the theoretical base, second part includes empirical review of literature in Nepalese as well as other context and finally the conceptual framework is constructed based on these reviews.

Concept and Measures of Bank Performance

European Central Bank (2010) defined performance of the bank as the ability of banks to create desired profits. Bikker (2010) identified costs, efficiency, profits and market structure as the key elements to gauge bank performance. Lebas (1995) defined Performance measurement is the transfer of complex reality of performance into simplified numerical concepts for its easy communication and action. There are various ways to measure the financial performance which can distinctly be divided into accounting measures, economic measures and market based measure (Matari, Swidi, & Fadzil, 2014). Actually, the measurement of bank performance can be varied and selection of particular measure depends on the objective of the study (ECB, 2010). Therefore, selection of the best performance measure is difficult work. Moreover, studying performance measure give different output on the basis of interest of stakeholders who interpret this term. Such varying opinions gives new insight in banking performance research. This study emphases accounting measures of

performance indicators: ROA, ROE and NIM which has been used by various researchers in the past to measure banks performance.

Hutchinson and Gul (2004) and Mashayekhi and Bazazb (2008) advocated the importance of accounting based measure of performance which clearly shows the management outcome. Hence, this measure is preferred over other measures. Their claim is further supported by Nuryanan and Islam (2011) by explaining the company's positive ROA indicating the attainment of pre-planned higher level of performance. McIver (2011) explained that accounting based measures basically stress on management outcome and are applied for the short-term performance measurement. He further advocated that these accounting measures are backward looking measures of performance which relay on historical data. Babalola (2013) highlighted that though financial ratios are simple in calculation, the interpretation makes them a useful tool for market participants to analyze the performance. He further supported the use of accounting measures over market measures as they are easy to understand and are based on audited figures. Matari, Swidi, and Fadzil (2014) explained the disadvantage of using market measures taking share price as an example which may reflect market expectation rather than true performance. He further, supported that market imperfection can lead to over or under valuation of share price unrelated to performance.

Further in context of Nepal, financial ratios are normally implied to measure financial wellbeing and quality of management (Pradhan & Shrestha, 2016). Also bank regulators uses financial ratios to help evaluate and interpret banks performance as a part of CAMEL system (Aliabadi, Dorestani, & Balsara, 2013). Among different accounting measures ROA is identified as mostly used measure of performance (Matari, Swidi, & Fadzil, 2014). They summarize the prior literatures undertaking

accounting measures till 2013 and identified ROA, ROE and NIM as the top three measures in terms of percentage. The recent studies taking accounting measures had also considers the above mentioned proxies for measuring performance of banks. Chowhury and Zaman (2018) analyzed the liquidity risk and performance on banks of Islam using ROA and ROE as performance measures. Similarly, Musiega, Olweny, Mukanzi, and Mutua (2017) determined the effect of liquidity risk on performance of banks taking ROA as a proxy for bank performance. Menicuci and Paducci (2016) explored the relation of bank specific characteristics and profitability in European banks who used ROA, ROE and NIM as profitability measures. Shen, Chen, Kao, and Yeh (2010) ascertained that liquidity risk is positively associated to net interest margin. Similarly, the studies made in Nepalese context has also used various accounting measures of performance (Shrestha, 2012; Bhattarai, 2015; Pradhan, 2016; Bhatt & Verghese, 2018; Risal & Poudel, 2020).

ROA basically measures the profit per dollar of assets which shows how banks are utilizing investments to generate profits (Naceur, 2003; Alkassim, 2005). ROA reflects the management effectiveness to utilize assets from an accounting prospective (Sinkey & Joseph, 1992). If the banks have similar risk profiles within the industry, ROA is a one of the useful tools for comparing their profitability which control deviation due to the differences in leverage. Therefore, this study has used ROA as one of the dependent variables of bank performance.

ROE is another performance measure which evaluates the value of shareholder (Siraj & Pillai, 2012). ROE ratio both informs about the amount of profitability and quantifies its general operational and financial management efficiency (Motley, 2006). Simply, ROE measures the amount of banks income that is returned as shareholders equity and one of the popular measures of performance since it directly

calculate investment return of the shareholder. Therefore, this study has also used ROE as a dependent variable of bank performance.

NIM is calculated as net interest income by total assets (Rani & Zergaw, 2017; Saif, 2014; Yeon & Kim, 2013). Bank's basic intermediation functions increase the volume of liabilities which enables them to purchase income earnings assets. Bank's management of its asset and liabilities is impacted by the spread rate measured by NIM which is the difference between interest earned and interest paid. (Goyal, Pallvi, & Bhatia, 2016). So, this study has employed NIM as the third measure of performance of the banks.

Table 1

Summary of Previous Studies Using Accounting Measures for Measuring Performance

Previous Studies	Bank Performance Measures
European Central Bank (2010)	Capacity to generate profit, cost ,efficiency and market structure
Matari, Swidi, and Fadzil (2014)	Classified into accounting, economics and market measures
Hutchinson and Gul (2014)	Accounting measures
Nuryanan and Islam	Accounting measure (ROA)
McIver (2011)	Accounting measure (ROA)
Babalola (2013)	Accounting measure
Matari, Swidi, and Fadzil (2014)	ROA, ROE and NIM
Chowdhury and Zaman (2018)	ROA, ROE
Musiega, Olweny, Mukanzi, and Mutua (2017)	ROA
Memicucci and Paolucci (2016)	ROA, ROE, NIM
Shen et al. (2001)	NIM

Concept and Measures of Liquidity Risk

Concept of Liquidity Risk

Derhman and Nilolaou (2012) defined liquidity as the ability to settle obligations immediately. They basically identified two components of liquidity risk: future random inflow and outflow of money and future random prices of obtaining liquidity. Derhman and Nilolaou (2012) clearly highlighted the differences between liquidity and liquidity risk and explained that liquidity is a binary concept, whereas liquidity risk can take infinite values. Further, liquidity is associated to one particular point whereas liquidity risk is forward looking and is measured over multiple horizon.

IMF (2008) defined liquidity as the capability of BFI's to make payments on time. Borio (2000); Strahan (2008); Brunnermeier and Pedersen (2007) focused on ability to raise cash with short notice. Basel Committee of Banking Supervision (2008) mixed the concept of liquidity and liquidity risk. Vento and La Ganga (2009) defined liquidity risk as the risk that financial institution doesn't have sufficient resources to meet its obligations or can only obtain funding at higher cost. From the above definitions it is clearly seen that liquidity risk has been defined differently in different literatures. This variation in definition is due to the consideration of different subjective features like solvency, cost of obtaining liquidity and immediacy.

In spite of similarities in key elements among the above presented definitions, consensus on liquidity risk definition still remains elusive due to its ambiguity and vagueness (Musakwa, 2013). Ambiguity in the term "Liquidity risk" which is derived from multiple sources. Vento and Ganga (2009) discussed various possible interpretations of liquidity risk. They explained that liquidity risk measures the ability of bank to convert asset and to raise fund from financial market in a quickly fashion. Vagueness in the term liquidity risk which is imparting multiple meanings. This

occurs when liquidity risk is considered along with market risk specifically when we use the term 'liquidity' without identifying the dimensions of liquidity risk.

Musakwa (2013) defined liquidity risk as the risk of individual agent being unable to fund its cash flows over a specified period. Unlike other measures this definition ignored solvency status. The reason is that liquidity problems occur regardless of solvency status. Second it omitted the cost factor. This is because we are most likely to face liquidity risk even if the cost of liquidity remains unchanged. Third, it omitted the component of obtaining funding with immediacy who explained immediacy is essentially to be a market liquidity risk characteristics. In conclusion, the definition provided by Musakwa is general, however, it provides a strong ground to understand liquidity risk.

Measures of Liquidity Risk

Liquidity risk is generally measured by liquidity ratio, and can be defined in two prospectives. First, definition uses liquid asset adjusted by size, including liquid assets to total assets ratio (Bourke, 1989; Molyneux & Thornton, 1992; Demirgüç-Kunt et al., 2003) and liquid assets to deposits ratio (Kosmidou & Pasiouras 2005, Shen et al., 2001). The second definition uses loans adjusted by size, including loans to total assets ratio (Demirgüç-Kunt, & Huizinga, 1999) and net loans to customer and short-term funding (Kosmidou & Pasiouras, 2007; Kosmidou, 2008).

Poorman and Blake (2005) advocated that it is incomplete to measure liquidity merely by using ratios. They emphasized on developing new measures of liquidity. Therefore, there are number of ways in which liquidity risk can be measured apart from using liquidity ratios in recent years.

Accordingly, Basel Committee on Banking Supervision (2010) presented two ratios namely Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio

(NSFR). LCR focuses to empower banks' ability to withstand short-term liquidity shocks whereas NSFR aims to withstand liquidity shocks for longer duration. A lower value of these ratios specifies higher liquidity risk. A number of research to study probable effect of BASEL III rules as a measure of liquidity risk then emerged.

Musakwa (2013) developed a unique method to calculate uncertainty associated with timing of cash flow to measure liquidity risk. Especially, they employed survival model to assign cash-flow to future period for banks products.

In Nepalese context liquidity and liquidity risk has been measured by using various ratios. NRB uses Net Liquidity Asset Ratio, Loan to Deposit Ratio and Statutory Liquidity Ratio as a measure of liquidity and commercial banks are instructed to report accordingly (Financial Stability Report, 2018). Investment ratio, liquidity ratio, capital ratio and quick ratio as a measure of liquidity position has been used by researchers in Nepal (Pradhan & Shrestha 2016; Bhatt & Barghese, 2018). Shrestha (2012) measured the liquidity position using NRB balance, cash vault balance and total liquid fund with relation to total deposit.

Most of the existing literatures used liquidity ratio as a measure of liquidity risk, but this study has applied funding gap ratio (FGAPR) of Saunders and Cornett (2006) as a measure of liquidity risk. They presented that liquidity risk is calculated on the basis of funding gap. Banks normally take deposits as stable source which can consistently finance the demand for loans. Funding gap is defined as the difference between deposit and loan and is written as:

Funding Gap = Deposit - Loan..... (1)

The above formula has been derived by multiplying the given formula of funding gap with -1 for easy interpretation of the variable and to standardize the

concept that increase in value of this independent variable indicates lower liquidity risk.

If value of funding gap decreases, the bank should fill this gap selling its liquid assets or borrowing from money market. This funding gap represents financial needs of the bank. When lending of bank increases with low level of liquid assets and if they receive comparatively lower amount of deposit, they are more exposed to liquidity risk. Therefore in this study, funding gap is taken as one of the variables for measuring liquidity risk. For standardization of funding gap, the variable of funding gap is divided by total asset. Lower value of this ratio indicates higher liquidity risk which makes significant impact on performance of banks.

De Young and Jang (2016) further elaborated the concept of funding gap and stressed more on banks activity of using short-term borrowing or selling of liquid assets which creates imbalance between short term liability and short term assets. They alternatively provided the approach to define funding gap as:

Funding Gap = Short term borrowing – Liquid Asset..... (2)

When we combine Equations (1) and (2) loan to deposit ratio can be derived which is taken as another variable for measuring liquidity risk as:

$$\frac{\text{Loan}}{\text{Deposit}} = 1 + \frac{\text{Short term borrowing} - \text{Liquid Asset}}{\text{Deposit}} \quad \text{.....(3)}$$

According to DeYoung and Jang (2016) the ratio of loan to deposit derived from equation 3 is related to new liquidity ratios specified by BASEL III especially NSFR. NSFR basically helps to reduce liquidity risk arising from mismatch between assets and liability (Ly et al., 2016). King (2013) defined NSFR as the ratio of available stable funding (ASF) divided by the required stable funding (RSF). If RSF is higher than ASF, banks are exposed to the risk of selling assets to repay the claim on liabilities. Finally if this ratio equals to 1, it indicates that bank's liquid assets are

equal to their liquid liabilities. From equation 3 if the ratio of loans to deposit is greater than 1, then it indicates that short-term borrowings are greater than liquid assets specifying the condition of pure liquidity risk. On the basis of above discussions another measure of liquidity risk based on loan to deposit ratio is standardized as (1- Loan to deposit ratio) in this study. The lower value of this ratio increases liquidity risk which is expected to make significant impact performance.

In addition to above explained new measures of liquidity risk, the study has employed Liquid Assets to Total Deposit as a third measure of liquidity risk which is used by various literatures in the past (Distinguin & Tanazi, 2005; Bourke, 1989; Kosmidou & Pasiouras 2005; Shen et al., 2001). This ratio measures the percentage of deposit obtained by writing off liquid assets when withdrawn suddenly. Therefore the lower value of this ratio indicates the exposure to liquidity risk thereby affecting the performance of the banks.

Table 2

Previous Studies	Liquidity risk measures
BCBS (2010)	Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR)
Musakwa (2013)	Survival Model
Drehmann and Nikolaou (2012)	Insurance premium on banks bid
Saunders and Cornett (2006)	Funding gap
DeYoung and Jang (2016)	Funding gap (standardized in the form of loan to deposit ratio)
Shen et al. (2001)	Liquid asset to total deposit
Kosmidou et al. (2005)	Liquid asset to total deposit
Pasiouras and Kosmidou (2007)	Net loan to customer plus short term funding
Nepal Rastra Bank (NRB)	Net Liquidity asset ratio, Loan to deposit ratio and SLR
Pradhan and Shrestha (2016)	Investment ratio, Liquidity ratio and Capital ratio
Bhatt and Barghese (2018)	Investment ratio, Liquidity ratio and Capital ratio
Shrestha (2012)	NRB balance, Cash vault balance and total liquid fund in relation to deposit.

Summary of Previous Studies for Measuring Liquidity Risk

Theoretical Foundation for Liquidity Risk and Performance

The main theoretical base underlying liquidity risk and performance is based on following supports:

Liquidity-Profitability Trade off Theory (TOT)

This theory states that the two financial terms liquidity and profitability expresses opposite relation to each other. Simply, pursuit of one is tradeoff of another (Dash & Hanuman, 2008). Simply, liquidity and performance have an inverse relationship according to trade off theory. Liquidity and profitability trade-off have become an important issue of any organization. This theory is all about managing the current assets and current liabilities so as to maximize the profitability.

To avert liquidity risk, bank need to hold more liquid asset. As bank hold more liquid asset in form of cash and bank deposit, bank mislay the chance of investing these liquid asset in other profitable sector. Moreover, bank has to pay more maintenance cost to manage this high liquid asset. For both these trouble, the profit margin of bank goes down. On the other hand, if bank do not hold sufficient level of liquid asset, bank cannot meet its short term liability as withdrawal demand by the customer and also becomes incapable to fund assets that could result for higher profitability. So, bank invite financial instability and liquidity risk. Therefore, to find an optimum level of liquidity and profitability is a real challenge for bank.

Berger (1995) conceptually applied "expected bankruptcy cost hypothesis." to access the impact of liquid asset on profitability and found that banks with higher liquid assets are benefited by higher perception in market and ultimately reducing their costs of obtaining funds and increasing profit. Similarly, Morris and Shin (2010) developed a model and showed that increase in liquidity ratio decreases the probability of illiquidity default.

If we consider increase in proportion of holding liquid assets by bank reduces their possibility of default, and if the "expected bankruptcy cost hypothesis" is correct, accumulating higher proportion of liquid assets should reflect a positive relation with profit. Similarly, higher accumulation of liquid assets imposes opportunity cost to bank since they provide low return in-comparison to other assets, ultimately affecting profitability negatively. Thus, overall, we assume liquid assets to exhibit a non- linear relation with profitability in which rise in proportion of liquid assets would improve bank's profitability through "expected bankruptcy cost hypothesis".

Theory of Financial Intermediation

It is the intermediary activity performed by banks who are associated to link surplus unit with deficit one. This task is very crucial as it assists in capital formation to make real investment (Allen & Santomero, 1998), and helps to reduce informational discrepencies (Scholten & Wensveen, 2003). In fact, intermediation enables bank to effectively mobilize their deposits in lending activities (Diamond, 1984).

Risk and Return Theory

This theory posit that with increase in risk, the return associated with it also increases. On contrary, with decrease in risk, the return will also be decreased. This shows that risk and return have positive relationship. If we link this theory with the relationship between liquidity risk and performance, the relation shows similar characteristics. Meaning, lower degree of liquidity risk specifies that the bank will have higher chance of being able to meet their short-term debt.

Anticipated Income Theory

This theory advocates that banks can manage their liquidity by sufficiently structuring their loan commitments. According to Nzotta (1997) this theory emphasize the earning ability and credit worthiness of the borrower which guarantees the adequacy of liquidity in bank.

Shiftability Theory

This theory explains that liquidity is a function of bank's ability to acquire assets which are easily marketable or convertible to cash when needed. This theory thus identify convertibility of bank's assets as a benchmark for measuring liquidity.

Liquidity Management Theory

Dodds (1982) defined liquidity management as the ability of banks to acquire funds from depositors and to determine the appropriate mix of such funds. This theory focuses on liability side of balance sheet. Nwankwo (1992) has also supported this position.

Commercial Loan Theory

This theory supports the view that short term lending is preferred by banks as such lending will be repaid easily by the borrower. However, this proposition has been heavily criticized by Dodds (1982) and Nwankwo (1992) who argued that this theory hinders economic growth of developing countries that require huge long term funds to provide a *big push* for development.

Liquidity Preference Theory

Bibow (2005) highlighted Keynes liquidity preference theory as "the transaction of current business and its use as a store of wealth." Elgar (1999) explained that liquidity preference is essential as they support to achieve transactions, speculative and precautionary motives of the banks.

Theory of Corporate Liquidity

Alexiou and Sofoklis (2009) proposed this theory who explained selection of liquidity depends on firm's access to capital market and significance of future investment. According to them, a liquid company can take benefit of available investment, cash discount and lower interest charge on borrowing.

Similarly some of the profitability theories include the Clark's Dynamic theory who stated that profit emerge in a changing economy and advocated that one should take advantage of this changing condition to generate profit. The Hawley's

Risk theory explained that risk in business arises from different sources who asserted that profit is the price paid for undertaking such risks.

The above presented liquidity management theories basically focuses on two issues. First, the banks should be confident that funding will be available at low cost. Second, liquidity management must meet profitability requirements without facing liquidity risk. Financial performance precisely is dependent on ability of banks to manage liquidity/profitability balance.

Risk and return theory simply posit positive relationship. Lower liquidity risk implies lower chance of banks to become bankruptcy and consequently lower return (Profitability). Many empirical studies proved that relation between liquidity risk and performance not necessarily follow the risk and return theories (Gitman & Zutter, 2012). In this notion, understanding the relation of liquidity risk with performance in line with risk and return theory becomes more interesting. This study is more focused is Liquidity – Profitability trade-off theory. According to Pourali and Arasteh (2013), this theory highlighted that companies maintain optimal level of liquidity and they always try to seek balance between profits and the amount of liquidity to minimize liquidity risk.

Review of Major Empirical Studies

Bourke (1989) studied the performance in European, North American and Australian banks and found that there is a positive relation of liquid asset with profitability.

Demirguc-Kunt and Huzinga (1998) examined the determinants of interest margins and profitability. The outcome reveled that banks which depend heavily on deposits were found to be less profitability.

Molyneux and Thornton (1992) examined the determinant of performance in European banks and found negative relation between profitability and liquidity. Banks are holding liquid assets as a mandatory requirement imposed by regulatory agencies.

Naceur and Goiaed (2001) examined the factors affecting performances in Tunisian banks. They identified that best banks hold higher level of deposit. Increase in ratio of total deposits to total assets specifies increasing amount of the fund that can be used in different profitable sectors.

Kosmidou, Tanna, and Pasiouras (2005) investigated the impact of bank's characteristics, macroeconomic conditions and financial market structure on bank's net interest margin (NIM) and return on average assets (ROAA) in the UK commercial banking industry. They found that liquidity measured by liquid asset to customer deposit had positive impact with ROAA but was negatively associated with net interest margin. The impact of loan loss reserve was positively significant with NIM which implies higher risks result in higher margin. Similarly, the influence of size on NIM was significant and macro-economic variables GDP growth rate and inflation had positive impact on performance

Distinguin Rouse and Tanazi (2005) in their study to predict banks financial distress used liquidity proxies and found that liquid assets to total deposits had a significant negative relation to change in liquidity.

Kosmidou (2008) examined the determinants of banks performance in Greece using unbalanced time series dataset. The result showed that less liquid banks have lower ROAA. They further investigated the impact of size, growth of GDP and inflation on ROAA. The study further found positive influence of size and growth of GDP and negative influence of inflation on ROAA.

Dietrich and Wanzeried (2009) observed banks in Switzerland and took yearly growth of deposits as independent variable to determine the bank's profitability who found that yearly growth in deposit didn't affect the profitability.

Chen, Shen, and Kao (2017) studied the impact of liquidity risk on performance and found that liquidity risk as measured by funding gap has significant positive impact on NIM and negative impact on ROAA and ROAE measure of bank performance. The study employed bank specific variables and macro-economic variables which could impact the relation between liquidity risk and performance. The study found positive impact of size on performance and negative impact of $size^2$ on performance. Further, LLP to total loans was significant with negative effect on bank performance.

Bordeleau and Graham (2010) analyzed liquid asset holding on profitability for US and Canadian banks. Result of the study suggested that there is a non-liner relationship whereby profitability is improved for those who hold liquid asset. However, the study further documented that there is certain level where holding further liquid assets reduces performance.

Alper and Anber (2011) investigated the bank-specific and macroeconomic determinants of banks profitability in Turkey over the period of 2002-2010. ROA and ROE are used as the proxies of banks profitability and found that liquidity as measured by liquid assets to total assets was positively related to performance. Further they found asset size and non-interest income had significant positive impact on banks profitability.

Gikonyo (2011) studied impact of asset liability management on profitability of commercial banks in Kenya. The study highlighted the importance of using

effective credit risk management techniques however the study failed to isolate the effect of deposit levels on financial performance of banks.

Olagunju, David and Samuel (2012) examined the relationship between liquidity management and profitability in Nigerian banks. Both the primary and secondary data were used and Pearson Correlation data analysis technique was used. The study found that there is significant relationship between liquidity and profitability.

Sufin and Kamarudin (2012) examined the bank specific and macro-economic determinants of profitability in Bangladesh banking sector over the period of 2000 to 2010 using 31 commercial banks and found liquidity to significantly affect the profitability. The proxy of liquidity was taken to be total loan/ total asset and proxy for profitability to be ROAA, ROAE and NIM. They found the mixed result where liquidity proxy was statistically significant and negative with ROAA but was positive and significant with NIM. They further employed various bank specific and macro-economic variables in which asset quality proxy loan loss reserve to gross loan had no effect on performance. Similarly, nontraditional activities had mixed result in which non-interest income to total asset had significant positive impact with ROAA and ROAE and significant negative impact with NIM. Further management quality proxy non-interest income to total asset has significant positive impact on ROAE and NIM. Further. Size proxy log of TA had significant positive impact on ROAE and NIM. Finally, macro-economic variable GDP had significant negative impact with NIM and inflation had significant positive impact on ROAA.

Arif and Anees (2012) examined the relationship of liquidity risk on profitability on 22 Pakistani banks from the period 2004 to 2009. Deposit, cash reserve, liquidity gap and NPL was taken as the proxies for liquidity risk. The study

found that increase in deposit and cash reserve positively affects the profitability with increase in investable fund but liquidity gap and NPL negatively affect the profitability.

Tabari, Ahmadi, and Emami (2013) based on 15 banks of Iran during the years 2003-2010 investigated the impact of liquidity risk on bank performance using panel data regression. Funding gap measured by the difference between loan and deposit to total asset has been considered as the proxy of liquidity risk which was found to negatively influence the performance measured by ROA. For robustness check they employed ROE as a performance measure and found similar result. The study further employed bank size, credit risk, GDP and inflation as control variables to see the impact on relation between liquidity risk and performance. Bank size had positive and meaningful effect on performance whereas credit risk proxy NPL to total loan had negative effect on performance. Both macro-economic variables GDP and inflation were found to have positive impact on performance.

Ongore and Kusa (2013) studied the determinants of bank performance in Kenyan commercial banks using linear multiple regression and generalized least square method on panel data using ROA, ROE and NIM as proxies of bank performance with moderating effect of ownership structure. Bank specific and macro-economic variables were employed. Liquidity variable measured by deposit to total asset and total loan to deposit was positive with performance but relationship was very week. Asset quality had negative impact on performance whereas management efficiency had significant positive impact on performance. Further, macro-economic variable GDP was not significant but inflation had significant negative impact on performance.

Said and Tumin (2013) examined the performance and financial ratios of commercial banks in Malaysia and China. ROAA and ROAE had been used as the proxies of bank performance and liquidity had been measured by net loans to deposit and short term funding and liquid asset to total asset. The finding indicates that liquidity ratios had no effect on performance in both the countries. However other financial ratios had mixed impact. The study found that credit risk variables were negatively related to ROAA in both countries whereas these variables were negatively related with ROAE in Malaysian banks. Similarly, operating expenses had negative relation with bank performance and size was found to be insignificant in both countries.

Ly (2015) investigated the impact of liquidity risk on banks performance in 23 European Union countries panel data from 2001 to 2011 and found a negative relationship between liquidity ratios and performance. The study employed NIM as a proxy of performance and liquid asset to total asset and interbank asset to interbank liabilities as proxy for liquidity risk.

Nishanthini and Meerajancy (2015) analyzed the tradeoff between liquidity and Profitability with the samples of state bank and private bank in Sir Lanka over period of 2008-2012. Current ratio and quick ratio had been used as the proxy of liquidity whereas ROA, ROE and Net profit margin were used for profitability.

The result reveled that there is negative impact of liquidity on profitability. The study also documented that banks with higher liquidity have lower profitability.

Jaffar and Manarvi (2015) examined and compared the performance of Islamic and conventional banks performing inside Pakistan during the year 2005 to 2009 by using CAMEL as a performance measure. The study found that Islamic banks performed better in terms of liquidity position measured by loan to asset ratio and

total deposit to total asset ratio and concluded that these liquidity variables have positive relation with the performance.

Marozva (2015) examined the relationship between liquidity and bank performance for South African banks from the period of 1998 and 2014. The study employed the Autoregressive Distributed Lag (ARDL)-bound testing approach and the Ordinary Least Squares (OLS) to examine the nexus between net interest margin and liquidity. Liquidity in this article is viewed in the context of the market liquidity risk measured by liquid asset to current liability and liquidity risk measured by loan to total deposit. The study finds that there is negative relationship between net interest margin and liquidity risk.

Khan and Ali (2016) investigated the relationship between liquidity and profitability of the commercial banks in Pakistan from the year 2008-2014 and found significant positive relation between liquidity and profitability. Current ratio and Quick ratio were employed as the proxies of liquidity whereas profitability was measured by gross profit margin and net profit margin.

DeYoung and Jang (2016) examined the management of liquidity position using traditional measure of loan to core deposit ratio on US commercial banks between 1992 to 2012 prior to implementation of BASEL III liquidity rules of LCR and NSFR. This traditional measure loan to core deposit ratio was found to be consistent with NSFR. The result also documented that the banks with loan to deposit ratio exceeding value of 1 is assumed to be under pure liquidity risk.

Musiega, Olweny, Mukanzi, and Mutua (2017) determined the influence of liquidity risk on performance of commercial banks in Kenya using 44 banks for 10 years from 2006 to 2015. The study documented that liquidity risk measured by liquid asset to total deposit had positive significant relation with performance. The study

also examined the impact of bank size on performance and found significant positive impact on performance.

Charmler, Musah, Akomeah, and Gakpetor (2018) examined the level of bank liquidity, the trend in banks liquidity and the impact of liquidity on profitability of 21 commercial banks in Ghana over 10 years period from 2007 to 2016 with the data arranged in the form of panel. ROA and ROE were used as the proxies of profitability and liquid asset to total asset and liquid asset to total interest bearing liabilities were taken as the proxies of liquidity. The study found that both the measures of liquidity was positively associated with ROA. However, relation of liquid asset to total interest bearing liability with ROE is found to be insignificant. The study employed control variables and bank size was reported to have positive association with profitability.

Chowdhury and Zaman (2018) analyzed the effect of liquidity risk on Islamic banks performance for the period of 2012 to 2016 operating in Bangladesh. ROA and ROE were used on bank performance whereas loan to deposit, liquid risky asset to total asset and capital to total asset were used on liquidity indicators. Regression analysis showed that there is negative relation between bank performance and liquidity indicators.

Yusuf, Nwufo, and Chima (2019) investigated the optimum synergy between liquidity and profitability management of quoted banks in Nigeria using ROA and ROE as the proxies of profitability measures and loan to deposit and loan to asset ratios as a proxy of liquidity. The result reveled that there is a significant optimum synergy between liquidity and profitability. The study further documented that this optimum relationship is obtained when a balance could be created between two performance indicators.

Review of Empirical Studies in Nepalese Context

Shrestha (2012) studied the impact of liquidity on profitability of commercial banks in Nepal from the year 2003 to 2011. The study concluded that the banks' NRB to deposit ratio and Cash-vault to deposit ratio have a positive significant impact on profitability. It also reported insignificant impact of Liquid fund to deposit ratio, Cash and bank balance to deposit ratio and Liquid fund to current liability ratio on profitability.

Pradhan and Shrestha (2016) examined the effect of liquidity on the performance of Nepalese commercial banks from the year 2005-2014 using regression model. They found that beta coefficients for liquidity ratio and quick ratio are negative with return on assets and return on equity indicating increased liquidity ratio and quick ratio decreases the bank performance.

Bhatt and Verghese (2018) investigated the influence of liquidity and profitability in commercial banks of Nepal from the year 2008-2017 using ROA and Net interest margin as the proxies of profitability and liquidity ratios, investment ratios and capital ratios as the proxies of liquidity measures . All the Liquidity measures were found to be insignificant with ROA and Net interest margin, however, capital ratio had significant negative effect on net interest margin.

Ojha (2018) studied the relationship between liquidity with bank specific and macro-economic variables in Nepalese commercial banks for seven years period from 2010 to 2017 who found that liquidity is negatively affected by ROA, ROE, NPL and IBR and positively influenced by GDP and Inflation.

Based on the theoretical reviews and past empirical studies discussed above, following conceptual framework has been devised. Performance is the dependent variable and liquidity risk has been taken as independent variable. Liquidity risk is

measured by Funding Gap Ratio (FGAPR), 1- loan to deposit ratio (LALDR) and Liquid Assets to Total Deposit ratio (LATD). Similarly, Performance proxies are Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). In addition to independent variable, bank specific and macro-economic control variables which has the significant effect on performance of bank has also been incorporated.

Conceptual Framework

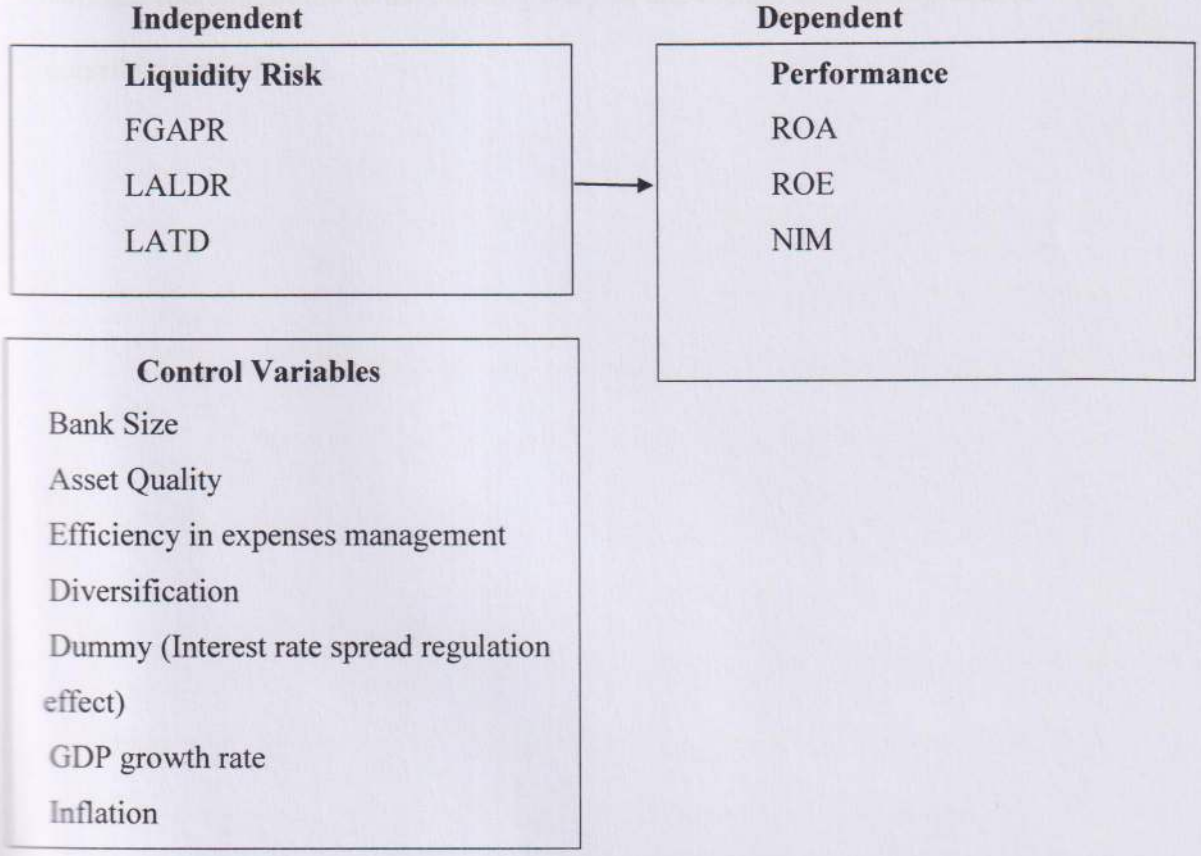

Figure 1. Conceptual framework for impact of liquidity risk on performance

In conclusion, there were reviews which identified significant positive relation between liquidity risk and performance and there were other folds of strong literatures supporting the negative effect of liquidity risk on performance. Few studies showed insignificant relationship. Above reviewed conflicting and contradictory findings in relation to liquidity risk and performance give an opportunity to conduct research in different parts of the world. Considering the significance of the relationship between

liquidity risk and performance, this research will attempt to investigate the impact of liquidity risk on performance of Nepalese commercial banks. Moreover, this study covers sixteen year's data from 2004 to 2019 during which significant changes in baking regulations and financial developments were remarkably observed. Unique dataset, consideration of total population, sufficient data, inclusion of bank-specific and country specific control variables and robust model based on relevant variables will add more literature to the existing body of knowledge as well as practical contributions in Nepal.

CHAPTER III

RESEARCH METHODOLOGY

Research methodology is associated with overall design of the study. It deals with the nature and sources of data, sample selection and the method of analysis employed. Quantitative method has used to study impact of liquidity risk on performance of Nepalese commercial banks. Positivist philosophy has been applied which not only examines the various theories but also establishes the facts based on empirical findings and supports.

Research Design

The research design is quantitative where secondary data have been used for multiple regression analysis. Using liquidity risk and its associated variables a causal relation have been established with the performance of commercial banks in Nepal. Panel data for a period of 16 years from 2004 to 2019 have been used to find the causal relation

Nature and Sources of Data

The study has used secondary source of information which include financial statements of 16 years' period from 2004 to 2019. The data is extracted from the website of Nepal Rastra Bank (NRB). Considerably longer period has been undertaken which constitutes a period of major developments in the Nepalese banking industry. The period also covers shift of banking regulation from Basel II to Basel III on majorities of banking indicators, reporting parameters and working modalities of commercial banks.

Sample Selection

This study considers only the A class commercial banks for the study period. Currently there are 27 commercial banks in operation. Total number of banks that

have gone to merger has also been included. These banks include Bank of Asia Ltd, Commertz and Trust Bank Ltd, Grand Bank Ltd and Lumbini Bank Ltd. Also, Prabhu Bank Ltd and Sanima Bank Ltd has been upgraded to A class commercial banks during the study period and has been considered for the study. Since liquidity risk faced by government banks is different than that of private ones, we have excluded 3 government banks for the calculation. Commercial banks occupy 64.29% of the share in total assets and liabilities of the financial system (NRB, 2018). Therefore, the sample banks considered are sufficient enough to capture the nature of overall BFI's.

Method of Analysis

To understand and explain the impact of liquidity risk on performance, the study adopts dynamic panel data analysis to meet research objectives. Panel data basically controls unobserved heterogeneity and they captures both cross-sectional and time series dimensions (Hsiao, 2005). Descriptive statistics, correlation analysis, test for multicollinearity, test for data stationary, and test for autocorrelation are used along with the application of robust standard error to correct heteroscadesticity and autocorrelation.

Definition and Measurement of Variables

Dependent Variable

The dependent variable is bank's performance. Performance is the process of measuring the result of the firms' operation in terms of monetary value (Padachi, 2006). Tuna (2013) identified profitability as the most common measure of evaluating performance. In fact, the measures of bank performance vary depending on the interest of the stakeholders who interpret the term differently. However, this study uses accounting measures of performance indicators which include Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM)

Return on Assets (ROA)

Among different accounting measures ROA is identified as mostly used measure of performance (Matari, Swidi, & Fadzil, 2014). ROA shows the effectiveness of management in the utilization of the assets of a commercial banks from an accounting prospective (Sinkey & Joseph, 1992). This variable is measured by:

$$\text{Return on Assets (ROA)} = \frac{\text{Net Income}}{\text{Total Assets}}$$

Return on Equity (ROE)

This ratio calculates the return on the shareholders equity investment. Shareholders are always keen to know the return for their investment. A business who has higher ROE is most likely to generate cash internally. Thus it can be assumed that company with higher ROE is better in terms of profit generation. It is calculated as:

$$\text{Return on Equity (ROE)} = \frac{\text{Net Income}}{\text{Total Equity}}$$

Net Interest Margin (NIM)

It measures the difference between interest income and interest cost on borrowed fund. It is calculated as:

$$\text{Net Interest Margin (NIM)} = \frac{\text{Interest Income} - \text{Interest Expenses}}{\text{Total Assets}}$$

Further, it reflects the intermediation cost. The higher value of NIM indicates higher profitability. However, higher NIM also indicates riskier lending behavior resulting to higher loan loss provisions (Khrawish, 2011).

Independent Variables

The independent variable used is liquidity risk. The following ratios are used as a measures of liquidity risk.

Funding Gap Ratio (FGAPR)

Following Saunders and Cornett (2006) liquidity risk is measured by computing funding gap ratio which is calculated as:

$$\text{Funding Gap (FGAPR)} = \frac{\text{Deposit} - \text{Loan}}{\text{Total Assets}}$$

Banks with lower funding gap ratio is expected to face greater liquidity risk

Liquidity after Loan to Deposit Ratio (LALDR)

DeYoung and Jang (2016) have compared and analyzed the liquidity risk position measured by loan to deposit ratio on the basis of following equation:

$$\frac{\text{Loan}}{\text{Deposit}} = 1 + \frac{\text{Short term borrowing} - \text{Liquid Assets}}{\text{Deposit}}$$

On the basis of above equation if loan to deposit ratio exceeds 1, then it indicates that short-term borrowings are greater than liquid assets showing that banks are under the condition of liquidity risk. On the basis of above presented equation and discussion another measure of liquidity risk based on loan to deposit ratio is standardized as (1- Loan to Deposit Ratio) in this study. The lower value of liquidity after loan to deposit increases liquidity risk which is expected to make significant impact on performance.

Liquid Asset to Total Deposit Ratio (LATD)

Another measure of liquidity risk is the ratio of liquid assets to total deposit and is calculated as:

$$\text{Liquid Asset to Total Deposit} = \frac{\text{Liquid Asset}}{\text{Total Deposit}}$$

This ratio indicates what percentage of customer's deposits could be met if they are withdrawn suddenly. Larger value of this ratio specifies that the bank is less likely to face funding difficulties. A negative relationship is expected between this variable with performance.

Based on the above discussed theoretical and empirical evidences relating to liquidity risk and performance, following hypothesis has been devised:

Hypothesis 1(a) Liquidity risk has significant effect on returns of commercial banks in Nepal

Definition of Bank and Country Specific Control Variables

To study the relation between liquidity risk and performance, some bank specific and country specific macro-economic control variables are considered which include:

Bank Size (SIZE)

It is measured by the natural logarithm of total assets (Athanasoglou, Brissimis, & Delis, 2008). In fact effect of size on performance is ambiguous. Through economies of scale and increased operational efficiency size generally has positive effect on performance (Bourke, 1989). Other studies suggested that this relationship is non-linear (Athanasoglou et al., 2008; Lee & Kim, 2013). Some studies have found a negative impact of size on bank profitability (Pasiouras & Kosmidou, 2007).

Asset Quality (Quality)

It is captured by loan loss provision to total loans and is expected to have negative relation with performance (Sufian, 2009). Kosmidou (2008) explained that ratio of loan loss provision to total loans explains the amount that has been provisioned out of total lending which specifies asset quality. A better quality is ascertained if banks have lower non-performing loans or lower loan loss provisioning. Miller and Noulas (1997) explained that with exposure to risky loan, accumulation of unpaid loans increases which ultimately reduces profitability. Therefore, this variable is expected to have lower coefficient to get better asset quality.

Efficiency in Expenses Management (COST)

Efficiency in expenses management is normally attributed to the ability to control costs or overheads for running the bank. It includes all the operating expenses incurred during the entire operation. It is expected to have a negative relation with profits and margins. Many studies used operating expenses to Total income as a proxy of efficiency in expenses management where a high ratio indicates a lower efficiency (Louzis, Vouldis, & Metaxas, 2012).

Diversification (DIV)

Diversification basically affects performance positively. Increase in non-interest generating activities specifies greater involvement in diversification. Diversification in this study will be calculated by using Herfindahl Hirschmann Index (HHI)

Interest Rate Spread Regulation

It is defined as difference between interest earned on asset and interest paid on deposit (Baraja et al., 1999). Interest rate spread normally has positive significant effect on banks performance (Demirguc-Kunt & Huizinga, 1998; Alhassan, Fred, & Erasmus, 2018). High spread rate may increase the profitability of banking system. However, increase in spread rate cannot always be a good indication of the efficiency which reflects inadequate regulation (Patel, 2018). So, the interest rate spread regulation is mostly like to make impact on performance of banking system. To control for the effect of interest rate spread regulation on bank performance relationship dummy variable has been used. The dummy takes value 1 before the implementation of interest rate spread regulation and 0 otherwise.

GDP Growth Rate (GDP)

Macroeconomic variable GDP growth rate is expected to influence the relationship between supply of loans and demand for deposit. Favorable economic conditions would positively influence performance of banks.

Inflation (INF)

Macroeconomic variable inflation may have direct effect on bank performance (Staikouras & Wood, 2003). Sufian and Chong (2008) suggested negative relation with bank's profitability. However, Sufian (2009) indicated positive effects on bank's profit efficiency.

Statistical Analysis

Yearly data from the year 2004-2019 has been collected and constructed in the form of panel. These data are described, summarized and interpreted to derive the relationship. Mean, standard deviation, minimum and maximum values, bivariate correlations for the variables is calculated and analyzed.

Econometric Model

The panel data takes the general form as:

$$Y_{i,t} = \beta_0 + \beta_1 X_{i,t} + \varepsilon_{i,t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Y represents the dependent variable, which is the performance for bank i in period t; and Xi,t is a vector of explanatory variables for bank i in time t; ε represents the disturbance term; β_0 is a constant term; and β_1 represents the regression coefficient of the explanatory variables. i and t represents the cross-sectional and time-series dimensions respectively.

In the equation form, the model is given as:

$$Perf_{i,t} = f(\text{liquidity risk, control variables}) \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, liquidity risk variables are $FGAPR_{i,t}$, $LALDR_{i,t}$, $LATD_{i,t}$

And Perf (performance) is measured by ROA, ROE and NIM

The dependent variable bank performance is measured by Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). The independent test variable liquidity risk is measured by Funding Gap Ratio (FGAPR), Liquidity after Loan to Deposit Ratio (LALDR) and Liquid Asset to Total Deposit Ratio (LATD)

Bank specific variables affecting the relationship between liquidity risk and performance is added to overcome omission bias. Bank specific variables include bank size measured by natural logarithm of total assets (SIZE), asset quality measured by loan loss provision to total loans (QUALITY), efficiency in managing cost measured by operating expenses to total income (COST) revenue diversification measured by HHI index (DIV) and dummy variable for capturing the effect of interest spread regulation on performance. The dummy for 0 is assigned for the banks operating before interest spread regulation and dummy of 1 is assigned for the banks operating after interest spread regulation was implemented. Further, as all the banks are operated in same macroeconomic environment, the model may not offer valid results. Therefore, macro-economic control variables, real GDP growth rate (GDP) and Inflation (INF) have also been added.

Diagnostic Tests

The linear regression model is used to analyze the panel data of commercial banks operating in Nepal. The linear regressions model is run by using Stata as an econometric software package. The major diagnostic tests carried out are test for multicollinearity, test for heteroscedasticity, unit root test, test for autocorrelation and test for model specifications. These tests are discussed as follows.

Test for Multicollinearity

Multicollinearity is the situation where one independent variable is highly correlated with other independent variables. If Multicollinearity exists between the variables correct predictions cannot be made. Pearson coefficients of correlation between antecedent and outcome variable is calculated. Also, pairwise correlations are analyzed. Moreover, Tolerance and Variance Inflation Factor (VIF) confirms the collinearity issue. Most common recommended value regarding VIF is 10 and below. (Bruns & Bush, 2007). VIF is normally the reciprocal of tolerance level and calculated as:

$$\text{VIF} = \frac{1}{(1 - R^2)}$$

Where, R is the correlation coefficient of each pair of explanatory variables. VIF value of 10 indicates there is a tolerance level of 0.10.

Test for Panel Data Stationary

Test for panel data stationary is done to avoid spurious relationship between the dependent and independent variables. If the data are not stationary there is a high chance that mean and standard deviation would be non- constant. Fisher type unit root test is carried out to test stationary nature of panel data.

Test for Serial Correlation

When error term of previous period is highly correlated with the error term of current period then serial correlation exists. Wooldridge test is applied to identify the serial correlation between the error terms. Null hypothesis has been set as there is no first order autocorrelation in the panels.

Test for Heteroscedasticity

This test helps to know whether the variance of each disturbance term is equal or unequal across the range of values. Error terms needs to have constant variance

otherwise the overall model might be misspecified. The propose hypothesis is that there exists homoscedasticity (Constant error term). For this purpose, modified Wald test has been considered. The null hypothesis has been set as data is homoscedastic/constant variance across entities.

Model Specifications

There are many model specification tests. Among them, Hausman test is conducted to decide the appropriateness of the fixed effect or random effect model. Pooled OLS (with robust clustering) result and standard errors are compared and the results of fixed effect and random effect model are presented.

CHAPTER IV

RESULTS

This chapter reports and interprets the result from data analysis. The chapter is divided into two sections. The first section deals with analysis of data on liquidity risk and bank performance which includes descriptive and correlation analysis. Further, unit root test, model specification test, autocorrelation, multicollinearity, heteroskedaticity test has been presented. The second section deals with the conclusion drawn from the analysis.

Analysis of Data

The secondary data covering 16 years' period from 2004 to 2019 has been obtained from the annual report of banks and financial statistics of Nepal Rastra Bank. The collected data are analyzed, descriptive statistics has been presented and findings are reported in the following section.

Descriptive Statistics of Performance

The descriptive statistics of performance of commercial banks during the study period have been presented in the tabular form.

Table 3

Descriptive Statistics of Performance measured by ROA, ROE and NIM

	ROA		ROE		NIM	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
NABIL	2.577	0.732	36.493	9.371	3.697	0.412
NIBL	1.851	0.284	25.986	6.754	3.094	0.302
SCBNL	3.750	5.387	49.594	72.910	3.441	0.428
HBL	2.139	0.496	33.330	12.518	3.357	0.327
NSBI	1.327	0.517	19.585	7.190	2.663	0.624
NBBL	3.731	2.663	20.751	75.557	3.135	0.838
EBL	1.914	0.366	31.846	7.397	3.299	0.406
BOK	1.849	0.632	25.567	12.154	3.264	0.603
NCC	2.472	3.274	40.797	62.331	2.907	0.445
NIC	1.107	0.654	19.668	7.188	2.229	1.258
Lumbini	1.757	1.887	-49.749	238.308	2.522	1.628
MBL	0.970	0.527	12.261	6.642	2.591	0.548
Kumari	1.424	0.494	17.464	7.612	2.791	0.386
Laxmi	1.139	0.307	12.736	4.900	2.459	0.370
SBL	1.499	0.409	15.478	18.197	2.795	0.485
Global	1.241	0.481	14.773	5.452	2.739	0.815
Citizens	1.467	0.576	15.956	6.833	2.633	0.825
Prime	1.548	0.447	18.735	5.467	2.627	0.478
Sunrise	1.153	0.487	12.525	4.858	2.790	0.857
Grand	-0.036	2.609	-7.051	28.897	2.377	0.527
BOA	0.770	0.391	7.654	4.416	2.604	0.824
NMB	1.686	0.651	17.332	8.786	2.389	0.687
Kist	0.862	0.810	10.936	13.940	2.901	0.470
Janata	0.999	0.443	7.362	4.235	2.718	0.637
Mega	1.172	0.435	10.185	4.782	3.371	0.388
CTBNL	0.422	0.183	1.902	0.769	2.583	0.431
Civil	0.917	0.364	7.592	3.521	2.495	0.436
Century	0.804	0.337	7.294	3.979	2.308	0.480
Sanima	1.571	0.333	17.817	5.464	3.027	0.264

Table 3 presents the mean and standard deviation values of the performance measured by ROA, ROE and NIM. Mean value of ROA, ROE and NIM is highest for SCBNL (3.750%), SCBNL (49.594%) and NABIL (3.697%) respectively. The lowest mean values of ROA, ROE and NIM is for Grand (-0.036%), Lumbini (-49.749%) and NIC (2.229%) respectively. Similarly, the standard deviation of ROA is highest for SCBNL (5.387%) and lowest for CTBNL (0.183%). Standard deviation of ROE is highest for Lumbini (238.308%) and lowest for CTBNL (0.769%). Finally, the standard deviation of NIM is highest for Lumbini (1.628%) and lowest for Sanima (0.264%)

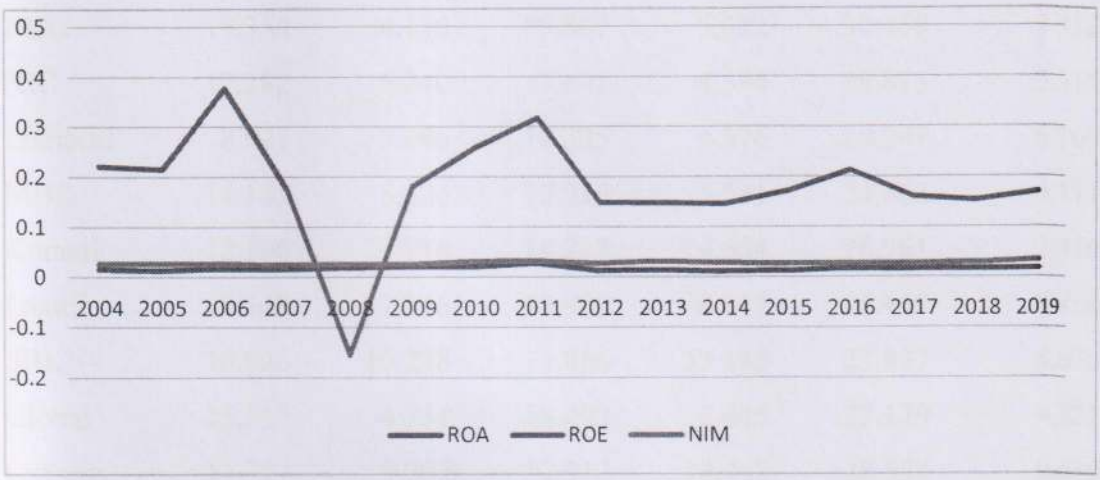

Figure 2. Average performance pattern over the study period

Figure 2 shows the pattern of yearly average performance measured by ROA, ROE and NIM of Nepalese commercial banks over the study period. Average performance measure in terms of ROE has shown fluctuating trend whereas ROA and NIM is showing constant trend.

Descriptive Statistics of Liquidity Risk

Liquidity risk in this study is measured by three variables i.e Funding Gap Ratio (FGAPR), Liquidity after Loan to Deposit Ratio (LALDR) and Liquid Assets to Total Deposit (LATD).

Table 4

Descriptive Statistics of Liquidity Risk Measures

	FGAPR		LALDR		LATD	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
NABIL	21.951	4.750	27.277	5.857	27.663	7.389
NIBL	19.274	6.058	23.308	6.629	25.629	3.253
SCBNL	41.944	10.237	49.675	11.264	43.547	7.986
HBL	24.439	8.827	28.746	10.233	29.568	9.451
NSBI	25.006	13.823	29.331	14.832	27.473	6.953
NBBL	14.977	6.644	20.503	8.101	35.201	7.917
EBL	19.588	4.288	23.618	4.467	35.217	4.461
BOK	16.259	5.150	19.444	5.939	30.436	6.982
NCC	15.354	4.150	19.567	5.422	30.458	7.312
NIC	12.382	6.240	17.991	4.394	28.873	5.315
Lumbini	8.921	3.996	11.325	4.576	29.241	5.160
MBL	14.131	5.526	17.210	5.541	24.666	4.111
Kumari	12.106	3.916	14.713	4.554	26.781	3.416
Laxmi	13.148	7.146	15.909	8.612	24.457	7.758
SBL	10.026	10.288	11.856	13.155	23.837	4.620
Global	15.517	4.754	18.492	5.445	27.179	4.321
Citizens	11.727	9.207	12.912	14.402	28.554	9.630
Prime	12.990	5.089	15.337	5.784	25.884	4.986
Sunrise	12.754	4.969	16.237	6.158	28.361	10.771
Grand	6.584	13.695	6.403	19.035	31.628	5.339
BOA	10.066	2.868	13.088	3.207	24.488	7.933
NMB	14.710	8.486	17.506	13.715	68.863	102.648
Kist	18.843	3.804	23.038	4.411	30.024	4.094
Janata	8.831	5.474	12.130	8.462	41.234	44.823
Mega	8.500	2.130	10.907	2.362	29.549	5.344
CTBNL	6.250	4.429	7.839	5.549	40.658	13.474
Civil	8.732	7.313	10.410	9.011	28.195	8.142
Century	10.644	4.613	13.114	4.905	26.021	5.008
Sanima	10.751	1.999	13.220	2.353	34.254	35.780

Table 4 presents the mean and standard deviation values of liquidity risk measured by Funding Gap Ratio (FGAPR), Liquidity after Loan to Deposit Ratio (LALDR) and Liquid Assets to Total Deposit (LATD). The highest mean value in terms of funding gap is of SCBNL (41.944%) whereas it is lowest for CTBNL (6.250%). The highest mean value with regards to LALDR is of SCBNL (49.675%) whereas it is lowest for Grand (6.403%). The highest mean value in terms of LATD is for NMB (68.863%) and lowest for SBL (23.837%). Similarly the standard deviation of FGAPR is highest for NSBI (13.823%) and is lowest for Sanima (1.999%). Further, standard deviation of LALDR is highest for Grand (19.035%) and is lowest for Sanima (2.353%). Finally, standard deviation of LATD is highest for NMB (102.648%) and is lowest for NIBL (3.253%)

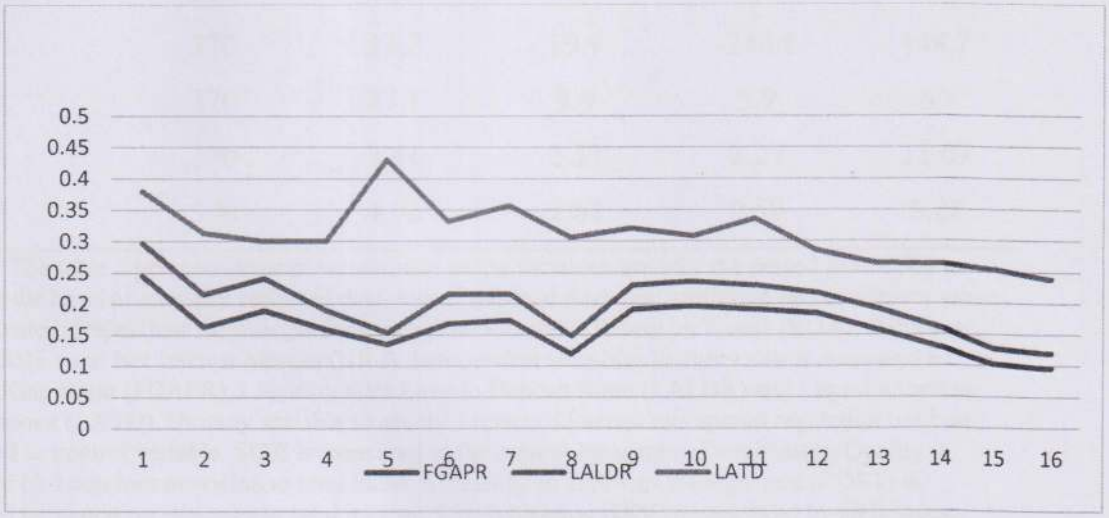

Figure 3. Average liquidity risk pattern over the study period

From the figure 3, the liquidity risk measured by FGAPR, LALDR and LATD is showing fluctuating trend with certain rise and falls during the study period.

Table 5

Descriptive Statistics of Overall Performance, Liquidity Risk and Control Variable

Variables	Obs	Mean	Std. Dev.	Min	Max
Dependent					
ROA	370	1.7	1.8	-6.1	24.6
ROE	370	17.6	59.3	-966.8	329.8
NIM	370	2.9	0.7	0.1	5.5
Independent					
FGAPR	370	15.9	10.2	-14.3	59.3
LALDR	370	22.2	12	-31.8	95.2
LATD	370	30.9	23.2	14.6	390.6
Control					
Dummy	370	0.492	0.501	0	1
SIZE	370	4.494	0.414	3.291	5.348
QUALITY	370	3.1	5	0	43.8
COST	370	33.2	19.9	-240.1	148.7
DIV	370	27.1	9.9	5.9	50
INF	370	7.41	2.57	2.27	11.09
GDP	370	4.72	1.83	0.59	8.22

The table 5 presents descriptive statistics of the variables used for the period from 2004 to 2019.On the basis of annually collected data, mean, standard deviation minimum and maximum values are calculated. Dependent variable performance is measured by Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). Independent variables liquidity risk is measured by Funding Gap Ratio (FGAPR), Liquidity after Loan to Deposit Ratio (LALDR) and Liquid Assets to Total Deposit (LATD). Dummy variable to see the impact of interest rate spread regulation has been employed as control variable. SIZE is measured as the natural logarithm of total assets, Quality is measured by Loan loss provision to total loans, Efficiency in expenses management (COST) is measured by operating expenses to total income, Diversification (DIV) is measured by HHI index, Inflation and GDP as macro-economic control variables are employed.

Table 5 presents the descriptive statistics of dependent, independent and control variables used during the study period. The descriptive statistics includes number of observations, mean values, standard deviations, minimum and maximum values. The number of observations taken were 370. The mean ROA for banks is 1.7% with standard deviation of 1.8%. ROA ranges from -6.1% to 24.6% during the study period. The mean value of ROE is 17.6% with standard deviation of 59.3%.

ROE ranges from -966.8% to 329.8% during the study period. The mean NIM is 2.9% with the standard deviation of 0.7%. Its value ranges from 0.1% to 5.5% to the maximum. The independent variable FGAPR mean stands at 15.9% with standard deviation of 10.2%. The minimum and maximum value for it ranges from -14.3% to 59.3%. Another independent variable LALDR mean value is 22.2% with standard deviation of 12%. Its value ranges from -31.8% to 95.2%. LATD mean value stands at 30.9% with standard deviation of 23.2%. The minimum and maximum value stands from 14.6% to 390.6%. Control variable dummy takes the mean value of 0.492 and standard deviation of 0.501. Its value ranges from 0 to 1. Another control variable size mean value is calculated to be 4.494 with standard deviation of 0.414. Quality variable mean is 3.1% with standard deviation of 5%. Cos inefficiency mean value is 33.2% with standard deviation of 19.9%. Diversification mean value is 27.1% and standard deviation value is 9.9%. Macroeconomic variable inflation mean stands at 7.41% with standard deviation of 2.57%. Its value ranges from 2.27% to 11.09% during the study period. Similarly, GDP mean value is calculated to be 4.72% and standard deviation to be 1.83% with minimum value of 0.59% and maximum value of 8.22%

Correlation Analysis

The pair wise correlation values between the independent variables in relation with different dependent variables are presented in Table 6 and Table 7,

Table 6

Correlation Coefficient Matrix between Independent Variables

Variables	FGAPR	LALDR	LATD	SIZE	QUALITY	COST	DIV	DUMMY	INF	GDP
FGAPR	1									
LALDR	-0.01	1								
LATD	0.03	0.046	1							
SIZE	0.205	-0.3	-0.172	1						
QUALITY	-0.061	0.033	0.001	-0.174	1					
COST	-0.058	0.016	-0.034	-0.106	0.176	1				
DIV	0.298	-0.037	0.167	0.06	0.345	0.259	1			
Dummy	-0.056	-0.314	-0.124	0.69	-0.124	0.052	0.025	1		
INF	0.105	-0.062	0.085	-0.186	-0.006	-0.1	-0.078	-0.225	1	
GDP	-0.136	-0.139	-0.002	0.281	-0.083	-0.069	-0.098	0.202	-0.3	1

*shows significance at the 0.05 level

Table 6 indicates that liquidity risk measure FGAPR has very small correlation with other two independent variables LALDR and LATD. Further FGAPR has low degree of correlation with other control variables in which SIZE, DIV, INF and GDP are significant at 5% level of significance. Similarly, LALDR has very small correlation with LATD. SIZE, Dummy and GDP has low degree of correlation with LALDR which are significant at 5% level of significance. Third liquidity risk variable LATD has low degree of correlation with SIZE, DIV, Dummy and INF which are significant at 5% level of significance. Other control variables also show low degree of correlation between each other.

Table 7

Correlation Coefficient Matrix between Independent and Dependent Variables

Variables	ROA	ROE	NIM
ROA	1		
ROE	0.229*	1	
NIM	0.422*	0.039	1
FGAPR	0.175*	0.19*	0.12*
LALDR	-0.039	-0.018	-0.136*
LATD	0.056	0.024	-0.143*
SIZE	0.064	0.108*	0.2*
QUALITY	0.119*	-0.182*	0.071
COST	-0.718*	-0.249*	-0.124*
DIV	0.276*	0.007	0.051
DUMMY	-0.108*	-0.017	0.069
INF	0.057	-0.016	0.041
GDP	-0.025	-0.067	0.046

*shows significance at the 0.05 level

Table 7 indicates that dependent variable ROA has low degree of correlation with independent variable LALDR and LATD. However, its correlation with FGAPR is relatively higher which is significant at 5% level of significance. Its relation with control variable QUALITY, COST and DIV and DUMMY is significant. ROE variable has low degree of correlation with LALDR and LATD. Again, it has comparatively higher correlation with FGAPR which is significant. Its correlation with SIZE, QUALITY, COST is also low, however they are significant. Finally, third dependent variable NIM has very small correlation with two independent variables LALDR and LATD. Again, its correlation with FGAPR is higher compared to other two independent variables and is significant. NIM relation with SIZE and COST is also significant at 5% level of significance.

From the above tables, it is observed that there is low degree of positive or negative correlation between the dependent and independent variables.

Unit Root Test for Panel Data Stationary

Unit root analysis need to be carried out in order to check the data stationary for the time series component. Data needs to be stationary before carrying out the regression analysis otherwise there is possibility of spurious regression and persistence of shock for infinite period. If the variables in the regression model are not stationary, standard assumption for asymptotic analysis will not be valid.

Fisher-type unit-root test for dependent and independent variables for panels have been carried out and the results are shown in Table 14. The null hypothesis is that all panels contain unit roots cannot be accepted at 5% level of significance as p-value (0.000) < 0.05. Hence, it is concluded that data are stationery.

Table 8

Unit Root Test for Dependent and Independent Variables (Fisher-type)

Variables	Statistic (Inverse chi-square)	p-value
ROA	161.7276	0*
ROE	176.7301	0*
NIM	144.8021	0*
FGAPR	139.3724	0*
LALDR	195.8148	0*
LATD	465.8261	0*
SIZE	222.0724	0*
QUALITY	158.8215	0*
COST	352.6816	0*
DIV	167.7525	0*
INF	98.1466	0*
GDP	205.8228	0*

Note. * $p < 0.05$

Regression Results

The regression results of influence of liquidity risk variables, Funding Gap Ratio (FGAPR), Liquidity After Loan to Deposit Ratio (LALDR) and Liquid Assets to Total Deposit (LATD) and performance measured by Return on Asset (ROA), Return on Equity (ROE) and Net Interest Margin (NIM) has been presented from Table 9 to Table 11 along with effect of bank specific and macroeconomic control variables.

The result of Table 9 shows that Funding Gap Ratio (FGAPR) has significant negative impact on performance measured by ROA at 5% level of significance. The result indicates that when banks have higher funding gap, their performance is reduced. The control variable efficiency in expenses management (COST) has significant negative relationship with performance at 1% level of significance and Diversification (DIV) has positive significant relation with performance at 1% level of significance. The relation of SIZE, QUALITY, DUMMY, INF and GDP are insignificant. Further, FGAPR is found to be insignificant with performance measure ROE. Quality has significant negative impact on ROE at 10% level of significance. All other variables are found to be insignificant with ROE. Finally, the relationship of FGAPR is again found to be insignificant with NIM with negative coefficient. However, control variable DIV has negative impact on NIM at 5% level of significance and INF has positive impact on NIM at 10% level of significance. Other control variables are found to be insignificant.

Table 9

Fixed Effect (fe) Regression of FGAPR with ROA, ROE and NIM (robust)

			ROA		ROE	NIM
	Coef.	p-value	Coef.	p-value	Coef.	p-value
FGAPR	-2.600	0.011**	43.400	0.181	-1.300	0.137
SIZE	-0.400	0.23	2.100	0.798	0.100	0.795
QUALITY	4.200	0.201	-183.000	0.062*	1.600	0.172
COST	-7.700	0***	-65.500	0.121	-0.400	0.115
DIV	6.400	0***	33.000	0.624	-1.800	0.014**
DUMMY	0.100	0.759	-4.300	0.255	0.200	0.381
INF	0.000	0.315	-1.600	0.285	0.000	0.069*
GDP	0.000	0.489	-3.400	0.21	0.000	0.682
Constant	4.400	0.003***	50.200	0.018**	2.900	0.009***

*** $p<.01$, ** $p<.05$, * $p<.1$

In table 10, the impact of Liquidity after Loan to Deposit Ratio (LALDR) with performance measures has been presented. LALDR is found to be negatively significant with ROA at 10% level of significance. Efficiency in expenses management (COST) has significant negative relationship with ROA at 1% level of significance and Diversification (DIV) has significant positive relationship with ROA at 1% level of significance. Other control variables SIZE, QUALITY, DUMMY, INF and GDP are found to be insignificant. Further the impact of LALDR with another performance measure ROE is found to be insignificant. However, QUALITY has significant negative relation with ROE at 5% level of significance. All other variables were found to be insignificant. Finally the relationship of LALDR with NIM is negatively significant at 5% level of significance. However significant negative relationship of DIV with NIM is observed at 5% level of significance. SIZE, QUALITY, COST, DUMMY, INF and GDP variables are found to be insignificant with NIM.

Table 10

Fixed Effect (fe) Regression of LALDR with ROA, ROE and NIM (robust)

	ROA		ROE		NIM	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
LALDR	-0.600	0.074*	-20.300	0.413	-0.500	0.036**
SIZE	-0.500	0.111	1.400	0.833	0.000	0.973
QUALITY	4.300	0.186	-187.500	0.062*	1.700	0.172
COST	-7.700	0***	-65.900	0.115	-0.400	0.115
DIV	6.200	0***	32.100	0.647	-1.900	0.01**
DUMMY	0.100	0.77	-5.300	0.218	0.200	0.381
INF	0.000	0.733	-1.600	0.328	0.000	0.227
GDP	0.000	0.724	-3.800	0.209	0.000	0.547
Constant	4.600	0.002***	67.300	0.005***	3.200	0.007***

*** $p<.01$, ** $p<.05$, * $p<.1$

In table 11, the impact of Liquid Assets to Total Deposit (LATD) on performance measured by ROA, ROE and NIM has been presented. The relationship of LATD with ROA performance measure is found to be negatively significant at 1% level of significance. SIZE has significant negative relationship with ROA at 10% level of significance. COST is found to have negative significant relationship with ROA at 1% level of significance and DIV is found to have positive significant relationship with ROA at 1% level of significance. Other variables were found to be insignificant with ROA. Further, LATD is found to be insignificant with ROE. However QUALITY is found to have significant negative relationship with ROE at 10% level of significance. Other control variables were found to be insignificant with ROE. Finally, LATD has negative significant relationship with NIM at 1% level of significance. Similarly, DIV is found to have negative significant relationship with NIM at 5% level of significance. All other variables were found to be insignificant with NIM.

Table 11

Fixed Effect Regression of LATD with ROA, ROE and NIM (robust)

	ROA		ROE		NIM	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
LATD	-0.500	0.002***	0.300	0.974	-0.400	0.002***
SIZE	-0.500	0.069*	2.900	0.767	0.000	0.932
QUALITY	4.100	0.203	-185.500	0.054*	1.600	0.21
COST	-7.700	0***	-66.100	0.119	-0.400	0.107
DIV	6.700	0***	34.500	0.637	-1.600	0.029**
DUMMY	0.100	0.683	-4.500	0.244	0.200	0.314
INF	0.000	0.495	-1.400	0.347	0.000	0.122
GDP	0.000	0.878	-3.700	0.22	0.000	0.316
Constant	4.700%	0.001***	52.900	0.013**	3.200	0.007***

*** $p<.01$, ** $p<.05$, * $p<.1$

Model Specification and other Diagnostics Tests

To ensure reliability and validity of the model various diagnostics tests have been carried out. The results are presented in the following sections and in appendix. Panel data set has been used for the study therefore, the appropriateness of fixed effect model (fe) is compared with random effect model (re) using Hausman test. The null hypothesis is preferred model is random effect. As *p* value is less than 0.05 for six regression models out of nine we rejected null hypothesis and used fixed effect method to see the impact of liquidity risk on performance.

Test of Multicollinearity

Multicollinearity has been tested using Variance Inflation Factor (VIF) test. The VIF result of all the regression models is presented in the Table 12

Table 12

Variance Inflation Factor (VIF)

	VIF	1/VIF		VIF	1/VIF		VIF	1/VIF
FGAPR	1.332	0.751	LALDR	1.17	0.855	LATD	1.102	0.907
SIZE	2.401	0.417	SIZE	2.163	0.462	SIZE	2.213	0.452
QUALITY	1.22	0.819	QUALITY	1.193	0.838	QUALITY	1.204	0.83
COST	1.149	0.87	COST	1.144	0.874	COST	1.155	0.866
DIV	1.397	0.716	DIV	1.247	0.802	DIV	1.318	0.759
DUMMY	2.171	0.461	DUMMY	2.087	0.479	DUMMY	2.022	0.494
INF	1.205	0.83	INF	1.237	0.808	INF	1.206	0.829
GDP	1.261	0.793	GDP	1.25	0.8	GDP	1.244	0.804
Mean VIF	1.517		Mean VIF	1.436		Mean VIF	1.433	

From the above table, the VIF of each variables is less than 10 which confirms that there is no multicollinearity issue among the variables used in the model.

General Test for Model Specification

To ensure that model adopted for empirical testing is correct and adequately based on theory or prior empirical studies, it is important to carry out the model specification test. For this purpose, Ramsey's general test of specification error has been adopted. The result is shown in Appendix. As the p values are less than 0.05 in all models, the null hypothesis of model has no omitted variables is rejected and concluded that omitted variable exists in the model. Various empirical studies have considered other measures of liquidity risk apart from the variables used in this study. Further the studies have included other control variables as well. All the variables couldn't be included in this study due to complexity of data and unavailability of sufficient parameters to calculate the variables.

Test for Heteroskedasticity

Test for heteroskedasticity has been done using Modified Wald test for group wise heteroskedasticity in fixed effect regression model. This test check whether the variance of each disturbance term is constant or not. Since, the result of Wald test shows p value less than 0.05, null hypothesis of homoskedasticity (constant variance) is rejected and concluded that there is presence of heteroskedasticity. Therefore robust model is used to control for heterogeneity. The results are presented in appendix.

Test for Serial Correlation

Test for serial correlation is normally done for macro panels with long time series over 20-30 years. However the test is carried out using Wooldridge test for autocorrelation. Serial correlation causes the standard errors of the coefficients to be smaller than they actually are and higher R-squared. Null hypothesis has been set as no first order autocorrelation. Since the result of Wooldridge test shows p value greater than 0.05, we failed to reject the null hypothesis and concluded that there is no serial auto correlation.

CHAPTER V

SUMMARY, DISCUSSION AND IMPLICATIONS

This chapter is mainly divided into three sections. First section presents the summary of the findings of the study, second section presents discussion based on the findings. Finally, the last section discusses the uses and implication of research. Finally, the critique and limitations of the study is outlined.

Summary of Findings

This study attempt to analyze the influence of liquidity risk on performance of the commercial banks in Nepalese banking industry using secondary sources of data. The relationship is measured by asserting various liquidity risk proxies namely Funding Gap Ratio (FGAPR), Liquidity after Loan to Deposit Ratio (LALDR) and Liquid Assets to Total Deposit (LATD) considering them as an independent variables. Similarly, performance proxies have been measured using accounting based measures of Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). In addition, the study has incorporated bank specific and macro-economic control variables that affect the relationship between liquidity risk and performance. Bank specific control variables include SIZE measured by natural logarithm of total assets, QUALITY of assets measured by Loan Loss provision to Total loans, Efficiency in expenses management (COST) measured by Operating expenses to Total income and Income Diversification (DIV) measured by HHI Index. A dummy variable is incorporated to see the effect of interest rate spread regulation which is assigned value of 0 before the implementation of interest rate spread regulation and 1 otherwise. Further, country specific control variables include GDP growth rate (GDP) and Inflation (INF)

This study has employed quantitative approach to set the causal relationship between liquidity risk and performance. The data has been analyzed using descriptive techniques. Correlation matrix has been created to see the correlation between dependent and independent variables. Finally, regression analysis were carried out to see the impact of independent variables on dependent variables. The secondary data are basically extracted from the annual report of Nepal Rastra Bank from the year 2004 to 2019 and unbalance panel has been formed with 370 observations.

Similarly from the descriptive statistics presented in Table 5 and Table 6, the mean and standard deviation figures are in accordance with industry average within minimum and maximum values. Figure 1 and figure 2 definitely shows the fluctuating trend of performance and liquidity risk measures over the period of study. n

The correlation analysis of performance proxy measured by ROA, ROE and NIM are found to have no correlation or correlated with very lower values positively or negatively with liquidity risk proxies measured by FGAPR, LALDR and LATD. All other correlation coefficients between the independent variables are reported to have low degree of correlation with each other, indicating that there is minimal chance of having multicollinearity issue.

Table 10 presents the regression result of Funding Gap Ratio (FGAPR) with performance proxies ROA, ROE and NIM. Funding Gap Ratio (FGAPR) is found to have significant negative impact on return measured by ROA at 5% level of significance whereas its relation with other two performance proxies ROE and NIM is found to be insignificant. This result suggests that as the difference of loan minus deposit increases banks performance in relation to return on assets decreases. According to Table 11, Liquidity after Loan to Deposit Ratio (LALDR) is found to have significant negative relationship with ROA at 10% level of significance and

negative relationship with NIM at 5% level of significance. However the relation with performance proxy ROE is found to be insignificant. Finally the table 13 shows the regression result of Liquid Assets to Total Deposit (LATD) with performance proxies in which LATD has significant negative relation with ROA and NIM at 1% level of significance. Its relation with ROE is again found to be insignificant.

From the regression results presented, control variables showed almost similar results when different proxies of dependent variables are regressed with proxies of liquidity risk. SIZE variable is found to have insignificant relationship with performance proxies except for ROA when it is regressed with LATD and has negative relationship at 10% level of significance. QUALITY variable is found to have insignificant relationship with performance proxies except for ROE which is found to have negative relationship at 10% level of significance in all the regression results. COST variable has negative relationship with ROA in all the regression results at 1% level of significance whereas it is found to be insignificant with other two performance proxies. DIV variable has positive relationship with ROA at 1% level of significance and negative relationship with NIM at 5% level of significance in all the regression models whereas its effect on ROE is found to be insignificant. DUMMY variable is found to be insignificant. Macro-economic control variables were found to be insignificant with performance proxies except for INF which is found to have positive relationship with NIM when regressed with FGAPR at 10% level of significance.

Table 13

Hypothesis	Independent Variables	Dependent variables	Hypothesized Sign	Finding
1 (a)	Funding Gap Ratio	ROA	+/-	-*
		ROE	+/-	Insignficant
		NIM	+/-	Insignficant
	Liquidity after Loan to Deposit ratio	ROA	+/-	-*
		ROE	+/-	Insignificant
		NIM	+/-	-*
	Liquid Assets to Total Deposit	ROA	+	-*
		ROE	+	Insignificant
		NIM	+	-*

A Summary of Results of Hypothesis Testing

*Note * Significant*

Discussion

On the basis of analysis, different proxies of liquidity risk measured by Funding Gap Ratio (FGAPR), Liquidity after Loan to Deposit Ratio (LALDR) and Liquid Assets to Total Deposit (LATD) has significant impact on performance proxies measured by Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM)

According to the regression result of funding gap ratio and its relation with performance proxies, it is found that when funding gap ratio increases performance of the banks measured by return on assets decreases. However, we couldn't find any relationship of FGAPR with other two performance proxies. This result is consistent with Chen, Shen, and Kao (2017) and Tabari, Ahmadi, and Emami (2013). In line with Tabari, Ahmadi, and Emami (2013) with increase in funding gap ratio the

liquidity risk of the bank decreases which can easily meet the demands and needs for withdrawal. However, the idle fund accumulated increases cost of fund which are borrowed at higher interest rate. If banks fail to invest these funds, loans and investments portfolio decreases. Consequently, bank performance deteriorates because of higher funding cost. The finding is consistent with risk and return theory which explains that lower the risk, lower the return.

From the regression result of Liquidity after loan to deposit ratio (LALDR) and its relation with performance proxies measured by ROA, ROE and NIM, it has been found that with increase in LALDR the performance of the banks measured by ROA and NIM decreases. However, LALDR has no relationship with ROE. With decrease in loan to deposit ratio the value of LALDR which is calculated as (1-loan to deposit ratio) increases thereby reducing liquidity risk. This result is consistent with Parab and Patil (2018) and Risal and Suprima (2019) who found that with increase in loan to deposit ratio, performance of the bank increases, implying that there is negative relationship between the profitability and level of holding high proportion of liquid fund. However, the result contradicts with the findings of Marozva (2015); Chowdhury and Zaman (2018). If bank's deposits are increasing new money and new clients are brought on board. The banks can increase their profit by increasing the volume of loans out of these new on boarded deposits reflected by increase in loan to deposit ratio. Conversely, holding of these deposits with minimum volume of lending to combat liquidity risk reduces net profit margin and return on assets. Intermediation theory advocates that banks with high intermediation activity are more profitable. In this line, accumulation of higher liquidity at the expenses of lower loan to deposit ratio decreases profitability. Further, higher LALDR not only mean poor deployment

of credit against deposit received but also a big gap between potential demand and realized supply.

Third liquidity risk proxy Liquid Assets to Total Deposit (LATD) has been regressed with performance proxies. The result found that with increase in liquid assets to total deposit ratio return on assets as well as net interest margin decreases. However, the study couldn't find any relationship with Return on equity measure. The result is consistent with Distinguin, Rouse, and Tanazi (2005); Demirguc-Kunt and Huzinga (1998); Molyneux and Thornton (1992) who found that with increase in liquid assets in relation to deposit, decreases the performance of the bank. The result contradicts with the findings of Bourke (1989) and Kosmidou, Tanna, and Pasiouras (2005) who reported that with increase in liquid assets profitability as measured by return on assets increases. The interesting result has been presented by Bordeleau and Graham (2010) who reported non-linear relationship of liquid assets to total deposit whereby profitability is improved for those banks who hold some liquid assets. However, holding further liquid asset after certain point reduces profitability which supports our findings. Further, our result is consistent with the idea that funding market reward a bank to some extent for holding liquid asset, thereby reducing its liquidity risk which has been advocated by expected bankruptcy cost hypothesis. However, this benefit can eventually be outweighed by the opportunity cost of holding such low-yielding liquid assets. Our findings goes beyond expected bankruptcy cost hypothesis and supports the opportunity cost of holding low yielding liquid assets which reduces profitability.

Control variables employed showed positive, negative and no relationship with performance measures of ROA, ROE and NIM. Size variable measured by log of total assets is regressed with LATD, the result is when size increases performance

measured by ROA decreases. This variable has no indicative relationship with other two performance proxies in other regression models. The negative relation of size with performance measured by ROA is consistent with Pasiouras and Kosmidou (2007) and Kosmidou et al. (2003) who found that larger banks tend to earn low profits. Similarly, our result is consistent with the findings of Yusuf, Chirstopher, Nwufo, and Chima (2019) who found no effect of size on performance measured by ROE. However, our result contradicts with the findings of Alper and Anber (2011) who reported increase in performance with increase in bank size. The negative relationship of banks size with performance could be due to diseconomies of scale for large institutions.

Quality variable is measured by loan loss provision to total loans. The study found that with increase in loan loss provision the performance measured by ROE is decreased. However the study couldn't find any effect of loan loss provision with other performance proxies measured by ROA and NIM. The result is consistent with most of the empirical studies who had ascertained negative relationship with performance (Chen, Shen, & Kao, 2017). It is obvious that higher credit risk measured by loan loss provision hurts performance. The more the financial institutions are exposed to high risk loans, the higher the accumulation of unpaid loans will be and lower their profitability.

Another control variable efficiency in expenses management (COST) is measured by the ratio of operating expenses to total income. This result showed that with increases in operating cost performance measured by ROA is reduced. However, this variable has no effect on other two proxies of performance measured by ROE and NIM. This result is as expected where increase in operating expenses results in the

reduction of performance. The result is consistent with Said and Tumin (2013) and contradicts with Ongore and Kusa (2013).

Diversification basically income diversification measured by HHI index shows that with increase in diversification the performance of the banks measured by ROA increases. However, the study found that with increase in diversification the performance measured by NIM decreases. We couldn't find any effect of diversification on ROE measure. The Positive impact of diversification on ROA is consistent with the finding of Petria et al. (2015) who found a positive and significant impact of diversification on the profitability of banks. With the diversification of income to non-traditional source generated from interest income, banks are most likely to increase their performance by increasing their activities to other sources of income. However, with regards to net interest margin the effect is negative. This is because as argued by Stiroh (2004) non-interest income activities are more volatile than net interest income activities. Therefore negative relationship between them is expected. Dummy variable is employed to see the impact of interest rate spread regulation on banks performance. The impact of Dummy variable is found to be insignificant in all regression models.

The study couldn't ascertain the effect of macro-economic control variables inflation and GDP on performance proxies measured by ROA and ROE. However, the study found that when inflation increases performance measured by NIM regressed on funding gap ratio also increases. The positive effect of inflation on NIM is consistent with the result of Kosmidou, Tanna, and Pasiouras (2005); Chen, Shen, and Kao (2010). However, inflation lead to increase in bank performance as long as the banks are able to anticipate future inflation and adjust interest rate to generate higher revenue than cost which leads to higher profitability.

Uses and Implication of Research

The findings from the regression analysis indicate a negative and significant relationship between funding gap ratio, liquidity after loan to deposit ratio and liquid asset to total deposit ratio on ROA and NIM measures whereas the effect of these variables are found to be insignificant with ROE in all regression models. The significance of the study can be attributed to the efficient utilization of available liquidity to better capacity to increase banks performance. In fact liquidity risk represents, a risk discount on performance which lowers banks profitability.

The implications of these findings are factual. With increase in funding gap ratio, the liquidity risk of the banks decreases. However the accumulation of these idle fund increases cost of fund. Further, if banks fail to invest these funds, loans and investments portfolio decreases which adversely affects performance. Additionally, accumulation of higher liquidity at the expenses of lower loan to deposit ratio decreases profitability. Higher LALDR implies poor deployment of credit against deposit and indicates big gap between potential demand and realized supply. Holding higher liquid assets in relation to deposit may be beneficial in short run where funding market reward a bank to some extent. However, this benefit can eventually be outweighed by the opportunity cost of holding such low yielding liquid assets.

Therefore, from above results and implications it can be recommended that banks should hold considerable amount of deposit to benefit from a supervisory perception on funding market. However, they need to fully utilize this deposit by boosting their investment and lending activities to productive and profitable ends.

This study has practical implications to regulators as well as the management of BFIs. This study gives insights on which indicators of liquidity to focus more to enhance profitability and reducing liquidity risk. The contribution of this study is the

use of alternative liquidity risk measures instead of merely using only liquidity ratios. These liquidity risk measures are close to the essence of using LCR and NSFR as a liquidity risk measure prescribed by BASEL III regulatory requirement. This gives further insights to the regulators regarding the implementation of new BASEL III liquidity rules in Nepal. It also gives broad view on the variables that affect liquidity risk enabling regulators to be more precise with implementing regulatory policies on liquidity risk management. For academicians and scholars intending to do their academic research on this field can take findings and methodology from this research as base and include in their literatures.

Critique of the Study

This study is focused on analyzing the influence of liquidity risk on performance of commercial banks in Nepal. Therefore, this result cannot be generalized for other financial institution like development bank and finance companies and others with different liquidity and performance measures and regulatory policies. So, this study leaves a room for future research to examine the influence of liquidity risk by including other development banks and finance companies.

This study contributes to the literature by using new liquidity risk measures along with other accounting based measures. However, the research can be conducted by using other better measures of liquidity risk and performance.

This research has been done considering limited variables. So, further research could include more variables such as taxation and regulation indicators and indicators of other quality measures. Another possible extension could be the examination of differences in determinants of liquidity risk between small and large, high profits and low-profits banks etc.

Similarly, this study is based on annual secondary data collected from the year 2004 to 2019. Future research can be carried out with larger dataset (longer period) with other forms of periodicity (quarterly or semiannually) to reconfirm and validate the current research outcome.

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APPENDIX I

Appropriateness of Fixed Effect and Random Effect Model Using Hausman Test

Regression Results

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
FGAPR	-.026	.006	-4.40	0	-.038	-.015	***
SIZE	-.004	.002	-2.02	.044	-.008	0	**
QUALITY	.042	.01	4.00	0	.021	.062	***
COST	-.077	.002	-33.33	0	-.082	-.073	***
DIV	.064	.006	10.59	0	.052	.076	***
DUMMY	.001	.001	0.63	.526	-.002	.004	
GDP	0	0	-0.70	.483	-.001	0	
INF	0	0	1.46	.145	0	.001	
Constant	.044	.009	5.19	0	.027	.061	***

Mean dependent var	0.017	SD dependent var	0.018
R-squared	0.779	Number of obs	370.000
F-test	146.558	Prob > F	0.000
Akaike crit. (AIC)	-2559.933	Bayesian crit. (BIC)	-2524.712

*** $p<.01$, ** $p<.05$, * $p<.1$

Regression Results

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
FGAPR	-.013	.006	-2.38	.017	-.024	-.002	**
SIZE	-.001	.002	-0.31	.756	-.004	.003	
QUALITY	.037	.01	3.62	0	.017	.057	***
COST	-.077	.002	-32.55	0	-.082	-.072	***
DIV	.076	.006	13.25	0	.064	.087	***
DUMMY	-.002	.001	-1.09	.277	-.004	.001	
GDP	0	0	-0.90	.366	-.001	0	
INF	0	0	0.38	.708	0	0	
Constant	.026	.008	3.37	.001	.011	.042	***

Mean dependent var	0.017	SD dependent var	0.018
Overall r-squared	0.752	Number of obs	370.000
Chi-square	1150.265	Prob > chi2	0.000
R-squared within	0.771	R-squared between	0.651

*** $p<.01$, ** $p<.05$, * $p<.1$

Hausman (1978) Specification Test

	Coef.
Chi-square test value	32.855
P-value	0

Regression Results

ROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
FGAPR	.434	.433	1.00	.317	-.419	1.286	
SIZE	.021	.142	0.15	.884	-.258	.3	
QUALITY	-1.83	.75	-2.44	.015	-3.306	-.354	**
COST	-.655	.167	-3.91	0	-.984	-.326	***
DIV	.33	.438	0.75	.452	-.531	1.191	
DUMMY	-.043	.105	-0.41	.681	-.25	.164	
GDP	-.034	.018	-1.85	.065	-.071	.002	*
INF	-.016	.013	-1.24	.217	-.042	.01	
Constant	.502	.616	0.82	.415	-.709	1.714	

Mean dependent var	0.176	SD dependent var	0.593
R-squared	0.084	Number of obs	370.000
F-test	3.821	Prob > F	0.000
Akaike crit. (AIC)	607.375	Bayesian crit. (BIC)	642.596

*** $p<.01$, ** $p<.05$, * $p<.1$

Regression results

ROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
FGAPR	.665	.331	2.01	.044	.017	1.313	**
SIZE	.153	.109	1.40	.161	-.061	.366	
QUALITY	-1.914	.648	-2.96	.003	-3.183	-.645	***
COST	-.695	.157	-4.43	0	-1.002	-.387	***
DIV	.404	.348	1.16	.245	-.277	1.086	
DUMMY	-.107	.086	-1.25	.212	-.275	.061	
GDP	-.038	.018	-2.11	.035	-.073	-.003	**
INF	-.02	.012	-1.64	.102	-.045	.004	
Constant	-.054	.47	-0.11	.909	-.975	.867	

Mean dependent var	0.176	SD dependent var	0.593
Overall r-squared	0.132	Number of obs	370.000
Chi-square	54.697	Prob > chi2	0.000
R-squared within	0.081	R-squared between	0.616

*** $p<.01$, ** $p<.05$, * $p<.1$

Hausman (1978) Specification Test

	Coef.
Chi-square test value	6.536
P-value	.587

Regression Results

NIM	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
FGAPR	-.013	.005	-2.92	.004	-.022	-.004	***
SIZE	.001	.001	0.47	.64	-.002	.004	
QUALITY	.016	.008	2.05	.041	.001	.032	**
COST	-.004	.002	-2.30	.022	-.008	-.001	**
DIV	-.018	.005	-3.88	0	-.027	-.009	***
DUMMY	.002	.001	1.71	.088	0	.004	*
GDP	0	0	0.54	.589	0	0	
INF	0	0	2.76	.006	0	.001	***
Constant	.029	.007	4.49	0	.016	.042	***

Mean dependent var	0.029	SD dependent var	0.007
R-squared	0.136	Number of obs	370.000
F-test	6.574	Prob > F	0.000
Akaike crit. (AIC)	-2759.152	Bayesian crit. (BIC)	-2723.931

*** $p<.01$, ** $p<.05$, * $p<.1$

Regression Results

NIM	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
FGAPR	-.005	.004	-1.13	.259	-.013	.004	
SIZE	.003	.001	1.99	.047	0	.006	**
QUALITY	.016	.008	2.07	.039	.001	.032	**
COST	-.004	.002	-2.27	.023	-.008	-.001	**
DIV	-.009	.004	-2.14	.033	-.018	-.001	**
DUMMY	0	.001	0.32	.749	-.002	.002	
GDP	0	0	0.45	.653	0	0	
INF	0	0	1.97	.048	0	.001	**
Constant	.017	.006	2.88	.004	.006	.029	***

Mean dependent var	0.029	SD dependent var	0.007
Overall r-squared	0.029	Number of obs	370.000
Chi-square	33.150	Prob > chi2	0.000
R-squared within	0.114	R-squared between	0.176

*** $p<.01$, ** $p<.05$, * $p<.1$

Hausman (1978) Specification Test

	Coef.
Chi-square test value	31.501
P-value	0

Regression Results

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LALDR	-.006	.004	-1.43	.154	-.013	.002	
SIZE	-.005	.002	-2.37	.018	-.009	-.001	**
QUALITY	.043	.011	4.00	0	.022	.064	***
COST	-.077	.002	-32.34	0	-.081	-.072	***
DIV	.062	.006	10.02	0	.05	.075	***
DUMMY	.001	.002	0.57	.572	-.002	.004	
GDP	0	0	-0.31	.76	-.001	0	
INF	0	0	0.44	.663	0	0	
Constant	.046	.009	5.07	0	.028	.064	***

Mean dependent var	0.017	SD dependent var	0.018
R-squared	0.767	Number of obs	370.000
F-test	137.296	Prob > F	0.000
Akaike crit. (AIC)	-2541.260	Bayesian crit. (BIC)	-2506.038

*** $p<.01$, ** $p<.05$, * $p<.1$

Regression Results

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LALDR	-.005	.004	-1.36	.173	-.013	.002	
SIZE	-.001	.002	-0.81	.415	-.005	.002	
QUALITY	.039	.01	3.74	0	.018	.059	***
COST	-.077	.002	-32.16	0	-.081	-.072	***
DIV	.074	.006	13.14	0	.063	.085	***
DUMMY	-.001	.001	-1.05	.294	-.004	.001	
GDP	0	0	-0.76	.45	-.001	0	
INF	0	0	-0.22	.823	0	0	
Constant	.031	.008	3.78	0	.015	.046	***

Mean dependent var	0.017	SD dependent var	0.018
Overall r-squared	0.758	Number of obs	370.000
Chi-square	1132.055	Prob > chi2	0.000
R-squared within	0.763	R-squared between	0.705

*** $p<.01$, ** $p<.05$, * $p<.1$

Hausman (1978) Specification Test

	Coef.
Chi-square test value	17.906
P-value	.022

Regression Results

ROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LALDR	-.203	.272	-0.75	.456	-.739	.333	
SIZE	.014	.143	0.10	.923	-.268	.295	
QUALITY	-1.875	.751	-2.50	.013	-3.351	-.398	**
COST	-.659	.167	-3.94	0	-.988	-.33	***
DIV	.321	.439	0.73	.466	-.543	1.184	
DUMMY	-.053	.106	-0.50	.62	-.261	.156	
GDP	-.038	.018	-2.06	.04	-.074	-.002	**
INF	-.016	.013	-1.20	.232	-.042	.01	
Constant	.673	.644	1.04	.297	-.594	1.939	

Mean dependent var	0.176	SD dependent var	0.593
R-squared	0.083	Number of obs	370.000
F-test	3.761	Prob > F	0.000
Akaike crit. (AIC)	607.868	Bayesian crit. (BIC)	643.090

*** p<.01, ** p<.05, * p<.1

Regression Results

ROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LALDR	-.12	.264	-0.46	.649	-.638	.398	
SIZE	.22	.104	2.12	.034	.016	.424	**
QUALITY	-2.113	.644	-3.28	.001	-3.375	-.852	***
COST	-.715	.157	-4.54	0	-1.023	-.406	***
DIV	.629	.33	1.91	.057	-.018	1.276	*
DUMMY	-.159	.084	-1.88	.06	-.324	.007	*
GDP	-.044	.018	-2.46	.014	-.079	-.009	**
INF	-.019	.013	-1.52	.127	-.044	.006	
Constant	-.224	.48	-0.47	.641	-1.164	.716	

Mean dependent var	0.176	SD dependent var	0.593
Overall r-squared	0.122	Number of obs	370.000
Chi-square	50.327	Prob > chi2	0.000
R-squared within	0.078	R-squared between	0.612

*** p<.01, ** p<.05, * p<.1

Hausman (1978) Specification Test

	Coef.
Chi-square test value	9.836
P-value	.277

Regression results

NIM	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LALDR	-.005	.003	-1.86	.064	-.011	0	*
SIZE	0	.002	0.06	.952	-.003	.003	
QUALITY	.017	.008	2.07	.039	.001	.032	**
COST	-.004	.002	-2.15	.032	-.007	0	**
DIV	-.019	.005	-4.10	0	-.028	-.01	***
DUMMY	.002	.001	1.58	.116	0	.004	
GDP	0	0	0.69	.489	0	.001	
INF	0	0	1.91	.057	0	.001	*
Constant	.032	.007	4.68	0	.019	.046	***

Mean dependent var	0.029	SD dependent var	0.007
R-squared	0.123	Number of obs	370.000
F-test	5.856	Prob > F	0.000
Akaike crit. (AIC)	-2753.598	Bayesian crit. (BIC)	-2718.377

*** $p<.01$, ** $p<.05$, * $p<.1$

Regression results

NIM	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LALDR	-.005	.003	-1.67	.094	-.011	.001	*
SIZE	.002	.001	1.72	.086	0	.005	*
QUALITY	.017	.008	2.11	.035	.001	.032	**
COST	-.004	.002	-2.21	.027	-.008	0	**
DIV	-.01	.004	-2.31	.021	-.019	-.002	**
DUMMY	0	.001	0.16	.874	-.002	.002	
GDP	0	0	0.40	.692	0	0	
INF	0	0	1.48	.14	0	0	
Constant	.02	.006	3.26	.001	.008	.033	***

Mean dependent var	0.029	SD dependent var	0.007
Overall r-squared	0.046	Number of obs	370.000
Chi-square	34.074	Prob > chi2	0.000
R-squared within	0.108	R-squared between	0.079

*** $p<.01$, ** $p<.05$, * $p<.1$

Hausman (1978) specification test

	Coef.
Chi-square test value	21.889
P-value	.005

Regression results

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LATD	-.005	.002	-2.51	.012	-.009	-.001	**
SIZE	-.005	.002	-2.63	.009	-.009	-.001	***
QUALITY	.041	.011	3.90	0	.02	.062	***
COST	-.077	.002	-32.67	0	-.082	-.073	***
DIV	.067	.006	10.53	0	.054	.079	***
DUMMY	.001	.001	0.79	.429	-.002	.004	
GDP	0	0	0.14	.892	0	.001	
INF	0	0	0.92	.358	0	.001	
Constant	.047	.009	5.28	0	.029	.064	***

Mean dependent var	0.017	SD dependent var	0.018
R-squared	0.770	Number of obs	370.000
F-test	139.578	Prob > F	0.000
Akaike crit. (AIC)	-2545.949	Bayesian crit. (BIC)	-2510.728

*** p<.01, ** p<.05, * p<.1

Regression results

ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LATD	-.005	.002	-2.43	.015	-.009	-.001	**
SIZE	-.002	.002	-1.12	.261	-.006	.002	
QUALITY	.037	.01	3.59	0	.017	.057	***
COST	-.077	.002	-32.46	0	-.082	-.073	***
DIV	.077	.006	13.48	0	.066	.088	***
DUMMY	-.001	.001	-0.77	.442	-.004	.002	
GDP	0	0	-0.34	.734	-.001	0	
INF	0	0	0.24	.809	0	0	
Constant	.031	.008	3.99	0	.016	.047	***

Mean dependent var	0.017	SD dependent var	0.018
Overall r-squared	0.760	Number of obs	370.000
Chi-square	1149.084	Prob > chi2	0.000
R-squared within	0.766	R-squared between	0.698

*** p<.01, ** p<.05, * p<.1

Hausman (1978) specification test

	Coef.
Chi-square test value	19.354
P-value	.013

Regression results

ROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LATD	.003	.144	0.02	.983	-.281	.287	
SIZE	.029	.144	0.20	.843	-.255	.312	
QUALITY	-1.855	.753	-2.46	.014	-3.336	-.374	**
COST	-.661	.168	-3.93	0	-.991	-.33	***
DIV	.345	.449	0.77	.443	-.538	1.227	
DUMMY	-.045	.105	-0.43	.667	-.253	.162	
GDP	-.037	.018	-1.98	.049	-.073	0	**
INF	-.014	.013	-1.08	.282	-.04	.012	
Constant	.529	.628	0.84	.4	-.706	1.764	

Mean dependent var	0.176	SD dependent var	0.593
R-squared	0.081	Number of obs	370.000
F-test	3.685	Prob > F	0.000
Akaike crit. (AIC)	608.486	Bayesian crit. (BIC)	643.708

*** $p<.01$, ** $p<.05$, * $p<.1$

Regression results

ROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LATD	.044	.133	0.34	.737	-.215	.304	
SIZE	.231	.105	2.20	.028	.025	.437	**
QUALITY	-2.087	.647	-3.23	.001	-3.355	-.82	***
COST	-.71	.158	-4.49	0	-1.02	-.4	***
DIV	.608	.34	1.79	.073	-.057	1.274	*
DUMMY	-.153	.083	-1.84	.066	-.316	.01	*
GDP	-.044	.018	-2.45	.014	-.079	-.009	**
INF	-.019	.013	-1.49	.136	-.043	.006	
Constant	-.32	.467	-0.69	.493	-1.236	.595	

Mean dependent var	0.176	SD dependent var	0.593
Overall r-squared	0.122	Number of obs	370.000
Chi-square	50.219	Prob > chi2	0.000
R-squared within	0.076	R-squared between	0.616

*** $p<.01$, ** $p<.05$, * $p<.1$

Hausman (1978) specification test

	Coef.
Chi-square test value	9.408
P-value	.309

Regression results

NIM	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LATD	-.004	.002	-2.58	.01	-.007	-.001	**
SIZE	0	.002	-0.15	.881	-.003	.003	
QUALITY	.016	.008	1.96	.05	0	.031	*
COST	-.004	.002	-2.39	.018	-.008	-.001	**
DIV	-.016	.005	-3.32	.001	-.025	-.006	***
DUMMY	.002	.001	1.85	.065	0	.004	*
GDP	0	0	1.20	.232	0	.001	
INF	0	0	2.50	.013	0	.001	**
Constant	.032	.007	4.76	0	.019	.045	***

Mean dependent var	0.029	SD dependent var	0.007
R-squared	0.132	Number of obs	370.000
F-test	6.306	Prob > F	0.000
Akaike crit. (AIC)	-2757.086	Bayesian crit. (BIC)	-2721.864

*** $p<.01$, ** $p<.05$, * $p<.1$

Regression results

NIM	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LATD	-.004	.002	-2.64	.008	-.007	-.001	***
SIZE	.002	.001	1.29	.197	-.001	.005	
QUALITY	.015	.008	1.96	.05	0	.031	*
COST	-.004	.002	-2.45	.014	-.008	-.001	**
DIV	-.008	.004	-1.75	.081	-.016	.001	*
DUMMY	.001	.001	0.59	.554	-.001	.003	
GDP	0	0	0.90	.366	0	.001	
INF	0	0	2.09	.037	0	.001	**
Constant	.021	.006	3.51	0	.009	.034	***

Mean dependent var	0.029	SD dependent var	0.007
Overall r-squared	0.053	Number of obs	370.000
Chi-square	39.554	Prob > chi2	0.000
R-squared within	0.119	R-squared between	0.085

*** $p<.01$, ** $p<.05$, * $p<.1$

Hausman (1978) specification test

	Coef.
Chi-square test value	27.225
P-value	.001

APPENDIX II

Omitted Variable Test

Ramsey RESET test using powers of the fitted values of ROA
Ho: model has no omitted variables
F(3, 358) = 35.54
Prob > F = 0.0000

Ramsey RESET test using powers of the fitted values of ROE
Ho: model has no omitted variables
F(3, 358) = 3.04
Prob > F = 0.0289

Ramsey RESET test using powers of the fitted values of NIM
Ho: model has no omitted variables
F(3, 358) = 1.12
Prob > F = 0.3392

3. Test for heteroskedasticity

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (29)  =   12240.83
Prob>chi2 =      0.0000
```