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Funding Liquidity and Risk-Taking: Evidence from the Commercial Banks of Pakistan

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Abstract: This study aims to examine the impact of funding liquidity risk on banks' risk appetite using annual data from 23 commercial banks listed on the Pakistan Stock Exchange for the period of 10 years, i.e., from 2011-2020. The study finds that banks with lower liquidity risk (as measured by the ratio of deposits to total assets) take on higher risk. The result showed that increasing deposition leads to an increase in Loan Loss Provision (LLP), -Z-score, and standard deviation of bank stock returns (SRV). However, the result showed that bank size and the capital buffer have a significant impact on banks' risk appetite in the event of excessive deposits. The outcome of the study has practical implications for banking regulators to encourage higher liquidity and capital requirements for banks. Thus would increase customers confidence in commercial banks by reducing danger of bank run and disciplining risk taking behavior of banks.

Keywords: Funding liquidity, Deposits, Size, Capital buffer, Risk-taking, Banks

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INTRODUCTION

The global financial crisis (2007-2008) highlighted the importance of liquidity for bank stability. Banking sector regulators are much more concerned about banks stability now than before (AlMatari, 2023). In response to this crisis, attention has been paid hold more liquid assets to strengthen banks' liquidity positions. In addition, the introduction of Basal III was another step to contain the bank's risk and ensure the stability of the entire economic system. Economic stability and progress require a strong banking system. Pakistan's growing financial system faces many challenges worldwide. In 2008, banks operating in Pakistan were struggling to lend to the private sector due to a shortage of funds. As a result, banks faced a drop in revenue. Pakistan is an emerging country whose government and businesses depend heavily on banks for funding. Therefore, it is very important to limit banks' risk-taking to ensure smooth economic progress.

Bank have very important role in any financial system. Banks provide valuable services on both assets and liabilities side of the balance sheet. Banks are a source of liquidity production through the process of risk transformation. To receive these funds from the depositors, the banks must provide the guarantee to return the deposited amount upon request according to the agreement. This ability of the bank to repay its outstanding debt when due is known as funding liquidity (Umar & Sun, 2016). In addition, funding liquidity risk is defined as a bank's failure to meet its obligations and has been measured by how much a bank aggressively bids on central bank auctions to ensure its liquidity (Drehmann & Nikolaou, 2013; Khumpaisal et al., 2018). The risk of a liquidity squeeze was perceived as a major threat to the stability of the financial system and the governance of financial institutions. Banks have been instructed to maintain a liquidity buffer to avoid liquidity squeezes and build the capacity to absorb smaller liquidity shocks.

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This concept of liquidity has gained prominence and is becoming the pivot of the financial regulatory framework after the global financial crisis (2007-2008). Hong, Huang, and Wu (2014) argued that systematic risk led to bank failure in 2009-10 after the GFC, adding that liquidity risk contributes to bank failure through systematic and idiosyncratic channels. Similarly, Acharya and Naqvi (2012) have made theoretical predictions about the short-term importance of liquidity for bank stability and risk appetite. Consistent with these predictions which suggest that banking risk increases as asset liquidity increases. This risk-taking requires further attention as it has large welfare costs, as observed in GFC. Deposits provide banks with "run" risk protection. As a result, banks with large deposits face less liquidity funding risk due to less market discipline which helps banks take aggressive risk. In addition, the deposit guarantee serves as a put option on bank assets. This study measures asset risk and overall risk using different proxies for each.

The z-score, liquidity creation, and volatility of stock returns are measured as the standard deviation of banks' stock returns and were used to measure overall bank risk. The z-score predicts the distance from the standard value. LC, i.e., liquidity creation involves the risk of financial intermediation. A relative measure was used to measure asset risk. RWA, i.e., risk-weighted assets, and LLP, i.e., Loan loss provisions better explain the bank's asset quality. In addition, banks holding large deposits are considered to have a low risk of funding liquidity and can meet their obligations, and deposit insurance reduces run risk (Khan, Scheule, & Wu, 2017).

To ensure the financial stability of the banking sector in Pakistan, the State Bank of Pakistan is in the process of implementing Basal III protocols. According to Khan et al. (2017), Basal III protocols emphasized the importance of liquidity to address the systematic risk to stabilize global banking. However, evidence is still lacking as to whether strengthening funding liquidity risk under the Basal III agreement will reduce banks' risk exposure. Therefore, there is a need to develop a better understanding of the relationship between funding liquidity risk and banks' risk appetite. This study aims to examine the impact of fluctuations in liquidity risk on the risk appetite of banks in Pakistan using annual data for banks listed on the Pakistan Stock Exchange from 2011 to 2020. The study also examined the impact of capital buffer and bank size on the relationship between banks' risk appetite and funding liquidity risk. Some characteristics and macroeconomic factors of the bank were controlled for measuring the relationship. To our knowledge of the existing literature, no previous study has tested this relationship in the context of Pakistan.

The bank management should know the liquidity situation of the banks. This understanding will improve the bank's investment portfolio. To avoid a run, banks must immediately focus on liquidity issues. A better understanding of the relationship between funding liquidity risk and banks' risk appetite is paramount to assist regulators and policymakers in designing guidelines to quantify bank managers' risk appetite. It offers opportunities to improve funding sources by properly matching them with the use of funds. In this way, it contributes to more financial elasticity and stability. In addition, the study highlights the importance of maintaining a strong capital base to effectively control banks' risk-taking. It also offers a new way to factor in other important factors in banks' risk appetite. In addition, the study selected up-to-date datasets that can help lenders, publicly traded companies, and banks by raising awareness of the importance of funding sources of liquidity and their impact on banks' risk appetite. Consequently, policies and disciplinary measures can be drafted to discipline risk-taking behavior of commercial banks. As a result customers confidence can be enhanced, and issues related to lavish managerial spending can also be tackled.

LITERATURE REVIEW

Underpinning Theory

According to Jensen's (1986) firm free cash flow hypothesis, managers make poor investment decisions when they have excess cash flow. Furthermore, a theoretical prediction by Acharya and Naqvi (2012) that large amounts of deposit inflows reduce banks' funding liquidity risks, followed by an intensification of managers' risk appetite as they engage in more aggressive lending to inflate their benefits. Managers' remuneration may be determined to some extent by the size of the loan they disburse, which may be a measure of their performance evaluation rather than the level of long-term risk inherent in lending. Therefore, banks that hold large deposits may follow substandard lending standards. Reviewing management's credit decisions is very costly and time-consuming. The bank conducts costly audits to review credit decisions made by managers only when it faces exceptional funding

liquidity risk. As a result, managers become overconfidence that a liquidity crunch will never materialize and no one will question their lending practices when they have excess deposits. This aggressive lending leads to capital depletion because of losses and the eventual collapse of the bank. Another major reason for bank failures is the principal-agent problem, also known as agency conflict, which motivates managers to lower lending standards and take on additional risk. Accordingly, based on the principal–agent theory, Cheng, Hong, and Scheinkman (2015) argued that risk-averse managers should be rewarded more because they face greater uncertainty when working in riskier financial institutions. Therefore, when there is excess liquidity, managers should be given the flexibility to evolve strategies to achieve high levels of remuneration that are commensurate with the riskiness of the bank. In the subsequent section, the study developed core hypotheses.

Hypothesis Development

Liquidity risk and bank risk-taking: The ease of attracting funds or deposits is known as funding liquidity. The refinancing liquidity is therefore high if an institution can borrow money easily and at reasonable costs (Brunnermeier, 2009). In addition, funding liquidity risk has been defined as the failure of a financial institution to promptly meet its obligation over a period. It is important to emphasize the difference between funding liquidity and funding liquidity risk. Funding liquidity is the ability to meet or not meet commitments. Whereas funding liquidity risk is related to the ability to meet future obligations. This means that future funding liquidity has an impact on current funding liquidity risk (Drehmann & Nikolaou, 2013). Liquidity risk and credit risk are probably not causally related, but both risks together trigger a bank's probability of default (Imbierowicz & Rauch, 2014). In addition to the above, Hong et al. (2014) argued that systematic liquidity risk triggers bank failures. Consistent with this view, Chiaramonte and Casu (2017) examined the relationship between structural liquidity and bank defaults and found that increasing liquidity stocks reduces bank defaults and distress. Similarly, Vazquez and Federico (2015) examined that the probability of bank failure decreases when banks have high funding stability. They also found that small banks are more prone to failure because they face more liquidity problems. Whereas the big banks usually fail because of insufficient capital buffers. These banks could not survive the GFC, which had high levels of debt and weak liquidity before the crisis. Previously, King (2013) examined that banks pay high long-term borrowing costs to maintain a high stable net funding ratio. Thus, these high-priced funds reduce the bank's profitability and risk, with the sole benefit of reducing the number of bank failures.

In addition, Egan, Hortas, and Matvos (2014) examined the impact of insured and uninsured deposits on bank stability and found that increasing deposit insurance improves financial stability only if the depositor benefits from this increased insurance. However, the model fails to explore the possibility that non-insured depositors can enhance their deposit insurance coverage by holding accounts with different banks. So, the additional risk that banks take is based on deposit insurance. Another study conducted by Guidara, Soumare, and Tchana (2013) examined banks in Canada and found that the reason Canada-based banks survived the financial crisis is by maintaining an excessive regulatory capital buffer and a leveraged capital buffer. Depositors at a bank withdraw money at random, and when the withdrawal exceeds the bank's liquidity buffer, that country's central bank acts as the lender of last resort. Additionally, banks with large deposits are less likely to suffer from a liquidity risk known as a run due to the existence of deposit insurance. A model developed by Repullo (2005) showed that banks' risk appetite increases when the central bank begins imposing heavy penalties for borrowing.

In addition, there is a negative correlation between funding liquidity risk and market liquidity (Drehmann & Nikolaou, 2013). The liquidity reserve, which is a certain part of bank deposits, was held by banks in the form of highly liquid assets with the central bank. Funding liquidity levels have fluctuated over time and maintaining a high level of liquidity is believed to have also contributed to the financial crisis. Adrian and Shin (2009) studied the aggregate liquidity of the financial sector and found that when liquidity levels are high, as represented by balance sheet growth, the financial intermediaries lend to those borrowers who have no potential to repay, and thus higher aggregate liquidity leads to the financial crisis. Furthermore, Wagner (2007) develops a model for theoretically predicting the relationship between bank asset liquidity and bank stability and examines that bank stability increases with bank asset liquidity only in times of crisis and not under normal circumstances. The liquidity of the banking sector can be improved by raising interest rates through a change in monetary policy. Lucchetta (2007) has argued that there is a direct relationship between banks' risk appetite and the risk-free rate. Investing in risk-free bonds increases as the risk-free interest rate increases. As a result, the money supply and interbank lending increase. This

excess liquidity inflates risky investments made by other banks. Therefore, it has been suggested in the theoretical and empirical literature that the bank's funding liquidity risk is very closely linked to risk-taking behavior. Thus, the first hypothesis of this study is consistent with the theoretical predictions of the empirical literature (Acharya & Naqvis, 2012; Khan et al., 2017).

H1: There is a negative relationship between banks funding liquidity risk and risk-taking.

Bank capital: Following the 2007 global financial crisis, the Basal Committee issued Basal III in 2011 to address the deficiencies of Basal II and further strengthen the financial sector, particularly banks. Basal III revised the calculations and methods used for the ratio calculation, along with a heavier burden on capital. According to Basal III, 6% should be represented by quality capital in 2019, of which 4.5% should be held as common stock. However, the minimum capital ratio was kept at 8% and to encourage banks to hold a capital buffer, a capital conservation buffer of 2.5% was formalized (Tanda, 2015). The likelihood of bank failure has been reduced by maintaining a high capital buffer. Therefore, banks maintain large capital buffers when they have riskier assets to reduce default risk (Shim, 2013). Therefore, the introduction of risky assets into the portfolio maintains high capital buffers and limits aggressive investments by the bank. The relationship between bank capital and risk-taking can be positive or negative, conditioned by the corresponding forces in managers, shareholders, and deposit insurance companies. In addition, managers who fear losing control in the event of bankruptcy prefer to take fewer risks. On the other hand, shareholders prefer less risk when the bank is well capitalized as they suffer higher losses in case of default (Jeitschko & Jeung, 2005). Just before the financial crisis, it was found that defaulting banks holding more capital had opted for less risk (Ashraf et al., 2022; Altunbas et al, 2007). In a similar context, it has previously been argued that shareholders in large capital banks suffer more losses and therefore take fewer risks (Repullo, 2004). Berger and Bouwman (2013) found that better-capitalized banks can survive the banking crisis.

In addition to the risk and capital association, the relationship between regulatory capital and liquidity was also examined. Distinguin, Roulet, and Tarazi (2013) have argued that banks with high levels of liquidity have low regulatory capital and consequently low stable net funding ratios. Likewise, the solvency standards of small banks in the US have been strengthened due to illiquidity, given that both the illiquid bank and the customer generate absolutely large withdrawals that can lead to bank run and hence collapse (Aziz, 2022; Carmona, 2007). However, the bank's risk depends on both liquidity and capital when banks maintain a low stable net funding ratio due to high liquidity creation. It was noted by Konishi and Yasuda (2004) that commercial banks' risk-taking was constrained by the capital requirement imposed by regulators. Similarly, Repullo (2005) has argued that there is an inverse relationship between bank risk appetite and capital requirement. Few other researchers have argued that banks should raise capital to avoid fines for violating minimum capital requirements. Thus, this capital increase leads to a reduction in bank risk (Jam et al., 2014; Lee & Hsieh, 2013; Khan et al., 2017). Similarly, Hyun and Rhee (2011) also supported this risk reduction view by providing evidence that banks reduce their risky assets rather than issue equity to meet the high capital requirements.

Furthermore, it has been argued by Dell'Ariccia, Marquez and Laeven (2010) that banks only increase their risk appetite when they are well capitalized. With more capital, banks can absorb losses. Hence, Masih and Ibrahim (2015) found that privately owned Islamic banks maintain high capital buffers to protect shareholder interests from the adverse effects of crowding out business risk. In addition, the relationship between a bank's capital buffer and investment risk also fluctuates. Mehran and Thakor (2011) found that the shareholder takes less risk when capital is high. In contrast, Guidara et al. (2013) documented that there is no significant correlation between a bank's capital buffer and its risk. However, Jokipii and Milne (2011) have shown that banks reduce their risk appetite by increasing their capital buffer. However, banks avoid the fines associated with falling below regulatory capital by maintaining a capital buffer. Furthermore, Lindquist (2004) found that savings bank risk is negatively related to the capital buffer. In addition, Berger et al. (2008) found that in the period from 1992 to 2006, before the GFC, US bank holding companies typically held higher than required capital ratios but reduced capital ratios. In general, previous work has indicated that banks with a large capital buffer take on less risk when they have lower funding liquidity risk or high deposits compared to banks that are less capitalized.

H2: Bank capital buffer moderates the relationship between funding liquidity risk and banks' risk-taking.

Bank size: The study assumes that the bank's risk appetite should be influenced by the size of the bank. The previously published studies show that large banks are not necessarily riskier. Demirguc-Kunt and Huizinga (2011) documented that larger banks become profitable without impacting risk. Furthermore, using the z-score, it was investigated by Bertay, Demirguc-Kunt and Huizinga (2013) that there is no significant relationship between bank risk and its size. They further argued that it was easy for big banks to generate funds by issuing non-deposit funds and wholesale financing. While Berger and Bouwman (2013) examined the impact of banks' risk appetite and size using a sample of US banks, they documented that there is a positive relationship between banks' size and the bank's credit risk, which they determined by dividing the risk-weighted Have assets measured by total assets as defined in Basal I. In addition, a study by Laeven and Levine (2009) using data from 270 banks in 48 countries documented that there is a significant positive association between bank size and risk appetite. Previously, Beltratti and Stulz (2012) examined the variation in the performance of large banks during the GFC and found that smaller banks have higher idiosyncratic risk as measured by the Z-score. They also document the negative relationship between bank size and risk, but their results did not support their hypothesis as they only considered data from large banks. Perhaps there is empirical evidence in the past literature to support the above view that there is a negative relationship between the size of the bank and its risk appetite, since as the size of the bank increases, so does its stability, as measured by the z-score (Mercieca, Schaeck, & Wölfe, 2007). Furthermore, the implementation of Basal II motivated small banks to increase their risk appetite compared to large banks, since the large banks can choose between internal and standardized ratings for the rating option (Hakenes & Schnabel, 2011). Another study examined the impact of bank size on earnings volatility risk and found that there is a significant negative association between bank size and earnings volatility. They further noted that during the financial crisis, it was evident that there was a negative relationship (Jam et al., 2018; De Haan & Poghosyan, 2012).

Furthermore, it has been documented by Laeven, Ratnovski and Tong (2016) that as banks increase in size, so does their systematic risk, but this risk is negatively associated with bank capital, and this relationship is independent of the impact of bank size and capital on banks separately Risk. Likewise, the size and risk relationship was examined by Bhagat, Bolton and Lu (2015) using the z-score as a measure for risk calculation among the financial institutions and documented that the size of the financial institution is positively associated with the risk appetite of the bank. They also found that this size and risk relationship existed in pre-crisis and during crisis periods, but no longer holds in post-crisis periods. Furthermore, Vazquez and Federico (2015) found that small banks fail due to liquidity problems, while large banks with cross-border operations fail due to capital buffer inefficiencies. Another study by Khan et al. (2017) suggested that large banks take less risk when they have excess deposits, which they describe as low funding liquidity risk, and their results supported their view that bank size moderates the relationship between banks' risk appetite and bank funding liquidity risk. When banks have low funding liquidity risk, they go under;

H3: Bank size moderates the relationship between funding liquidity risk and banks' risk-taking.

METHODOLOGY

Data and Sample Selection

The main purpose of the study is to examine the impact of funding liquidity on the risk appetite of banks in Pakistan. The banking sector is a very important part of Pakistan's financial system. In addition, the global financial crisis of 2007-2008 and the Asian financial crisis of 1997-1998 increased the need for strict monitoring of banks' risk-taking. This study is quantitative in nature. Data was first extracted from the financial reports of 23 banks listed on the Pakistan Stock Exchange for 10 years (2011-2020). The Security and Exchange Commission of Pakistan (SECP) and the Pakistan Stock Exchange were also used as data sources. Macroeconomic variables data were obtained from the State Bank of Pakistan website. Also, the data of the bank returns were taken from the Pakistan Stock Exchange. The software used in this study is E-Views. Data were analyzed by descriptive statistics, correlation matrix, regression analysis, and unit root analysis. The unit of analysis is the individual bank. We have used annual data from all banks as most of the variables used in this study such as risk-weighted assets etc. were not reported in the banks' quarterly reports.

Variable Description

Dependent variable: Bank risk for bank *i* in year *t* has been expressed by different proxies of risk. To measure the bank risk the study has used five measures, risk-weighted assets to total assets, loan loss provisions to total assets, natural log of Z-score, liquidity creation to total assets and standard deviation of stock returns of the banks. Our choice in the selection of bank risk proxies is guided by Khan et al. (2007).

Table 1: Variable Construction

Variable	Construction	Data Source
Dependent Variable		
RWA	Risk-weighted asset/ Total Asset	State Bank of Pakistan
LLP	Loan loss provision/ TA	State Bank of Pakistan
Z-Score	return on assets + (equity/asset)/standard deviation of ROA	State Bank of Pakistan
LC	Liquidity creation/TA. Liquidity creation = 0.5 × illiquid assets + 0.5 ×liquid liabilities 0.5 ×liquid assets 0.5 ×illiquid liabilities 0.5 ×equity	State Bank of Pakistan
SRV	The standard deviation of daily stock returns of bank i in quarter t	Pakistan Stock Exchange
Independent Variable		
Deposit	Total deposits/ total assets	State Bank of Pakistan
Control Variable		
Asset	Natural logarithm of TA	State Bank of Pakistan
Loan	Total loans/ TA	State Bank of Pakistan
Equity	Total loans/ TA	State Bank of Pakistan
ROA	Net income/ TA	State Bank of Pakistan
INT	Interest rate	World Bank Data base
GDP IBSpread	GDP growth rate Interbank spread	World Bank Database World Bank Database
Interaction terms (Dummy variables)		
HCB	Dummy variable valuing 1 for the bank in highest quartile capital buffer banks and 0 otherwise. Capital buffer = (actual regulatory capital – RWA ×0.08) / RWA.	State Bank of Pakistan
Big	Dummy variable has value equal to 1 for the biggest quartile of banks otherwise 0	State Bank of Pakistan
HL	Dummy variable taking on values of 1 for banks in the top quartile by the ratio of total deposits to total assets and 0 otherwise	State Bank of Pakistan
Summary of liquidity creation calculation		
Illiquid assets	All loans except consumer, Investment in unconsolidated subsidiaries Intangible assets (Goodwill & other intangible asset), Premises and fixed assets, other assets	
Liquid assets	Cash and balances due from other institutions, Held-to-maturity securities, Available-for-sale securities Trading assets, Fed funds sold	
Liquid liabilities	Transactions deposits (All non-interest bearing deposits), Savings deposits, Overnight federal funds purchased, Trading liabilities	
Illiquid liabilities	Subordinated debt, Other liabilities	
Equity	Total equity	

Independent variable: The funding liquidity risk has been measured by liquidity for bank *i* in year *t*-1. The study has assumed that there is a lagged relationship between funding liquidity risk and risk-taking by the bank. It implies that a reduction in the risk associated with funding liquidity leads to enhance risk-taking by the bank in the subsequent year. The study used total deposit to total assets as a ratio to measure funding liquidity risk. The

proxy has been taken from the studies of Acharya and Naqvi (2012) and Khan et al. (2017). Both have argued that when there is excess deposit in the bank, it motivates the managers to take excessive risk because the extra deposit decreases the run risk and consequently the risk of facing a funding crisis also decreases.

Control variables: This study has used several control variables for macroeconomic as well as banks specific variables for bank *i* in year *t*-1. Using natural log of total assets(Assets), returns on assets (ROA), total equity to total assets (equity), and total loans to total assets(Loan) as a potential determinant of risk-taking by banks is in line with previous literature (Raz, McGowan & Zhao, 2022; Distinguin, Roulet & Tarazi, 2013; Lee & Hsieh, 2013; Casu, Clare, Sarkisyan, & Thomas, 2011; Laeven & Levine, 2009; González, 2005). But as the study has used the Z-score as a measure of risk and ROA and total equity to total assets have been used in the calculation of Z-score as well. Thus the study has not used these two as control variables as this may lead to fictitious results. The study has included macroeconomic variables interest rate, interbank spread and the growth rate of the real GDP as control variables for measuring the effect of the risk of funding liquidity on banks' risk-taking.

Econometric model: The study has used a panel regression in line with prior empirical studies like (Bechtel, Ranaldo, & Wrampelmeyer, 2023) to examine the impact of liquidity funding risk on banks' risk-taking. The study has included bank-specific and macroeconomic control variables which can affect risk-taking by the banks. Bank-specific impact has been apprehended by introducing bank dummies and time-specific factors have been introduced by year dummies. Furthermore, for apprehending macroeconomic effects, time dummies have been used. The baseline model is;

$$\text{Risk}_{i,t} = \alpha \text{Liquidity}_{i,t-1} + \beta \text{ Controls }_{i,t-1} + y_i + \varepsilon_{i,t} \tag{1}$$

The coefficients α, β and γ determines the extent to which the independent variable causes variation in the dependent variable. Moreover, εit is the error term for each bank *i* in year *t*. The study has extended the baseline model to incorporate the impact of bank size and capital buffer.

$$\text{Risk}_{it} = \alpha_1 Testdummy_{i,t-1} \times Liquidity_{i,t-1} + \alpha_2 Testdummy_{i,t-1} + \alpha_3 Liquidity_{i,t-1} + \beta Controls^{+}_{i,t-1} + y_i + \varepsilon_i \tag{2}$$

To measure the effect of bank types and periods the study has used test dummies. The study used three dummies HCB, Big and HL. First HCB takes the value of 1 if the bank is in the top quartile in terms of capital buffer otherwise zero. Likewise big take the value of 1 if the bank is in the top quartile in term of its total assets otherwise is zero. The study has measured the size of the capital buffer as the excess of regulatory capital over the minimum capital requirement. The second indicator is HL taking the value of 1 if the bank is in the top quartile in terms of ratio of total deposits to total assets and else wise zero. To remove the problem of heterogeneity, the study has used all the balance sheet and income statement values as a ratio of total assets. The data of Z-score is highly skewed that's why the study has used its ratio with total assets as guided by the literature to measure the risk of banks (Laeven & Levine, 2009). i showed the omitted bank-specific effect.

Funding liquidity risk proxy: It has been predicted by Acharya and Naqvi (2012) and Khan et al. (2017) that those banks tend to take more risk which have low funding liquidity risk i.e. high deposit. The deposit has been used as a proxy of funding liquidity risk because it acts as a shield against run risk. Every bank upholds a certain amount of deposit as a reserve for liquidity. Likewise, banks rely more on deposits to fund their long-term assets. As the deposits are insured so this insurance further adds a shield in taking more risk.

Bank Risk Proxies:

Asset risk - For measuring banks risk the literature has supported the use of risk-weighted assets (Delis, Hasan & Tsionas, 2014; Stolz & Wedow, 2011; Jokipii & Milne, 2011; Rime, 2001). The Basal Accord has used the ratio of risk-weighted assets to total assets as a measure of credit risk. The risk-weighted assets have been calculated as per basal rules and they represent the overall riskiness and quality of the banks' assets. Furthermore, to minimize the possibility of loan losses the banks also maintain a loan loss provision. Thus if there is a high loan loss provision, it shows that banks are having more risky assets thus it is also a measure of the riskiness of the bank. Research by Cebenoyan and Strahan (2004) has used the standard deviation of loan loss provision to total assets as a proxy for bank risk. Therefore this loan loss provision shows that the bank is doing aggressive lending.

Overall bank risk - For measuring the overall riskiness of banks the study has used Z-score. The high value of the Z-score shows high bank stability. Z-score has been calculated by adding ROA and equity to total assets divided by the standard deviations of return on assets. According to Houston et al. (2010), this value signifies the deviation from the mean by which the profit of the bank would fall to drain the equity capital of the bank. So Z-score is the distance of any bank from solvency (Laeven & Levine, 2009). It has been used to measure the riskiness of bank by several empirical studies (Khan et al., 2017; Ramayandi et al., 2014; Delis et al., 2014; Houston et al., 2010). It is calculated as under;

$$Z- \text{ scores } = \frac{\text{Return on Asset } + (\text{ Equity/Asset })}{\text{Standard Deviation of Return on Asset}} \tag{3}$$

The study calculated the standard deviation of ROA by using 3 years rolling window. Another proxy for bank risk has been introduced by Berger and Bouwman (2009) known as bank liquidity creation. It measures the extent to which the bank finances its illiquid assets with its liquid liabilities. The difference in maturities of different assets and liabilities of the bank creates a financial intermediation risk. Thus more liquidity leads to more intermediation risk. In literature this ratio has been used by Berger et al. (2016), Horváth et al. (2014), Distinguin et al. (2013) and Berger and Bouwman (2009) to measure risk. It takes into account an enormous number of items from the balance sheet for its calculation. More specifically this study has followed Khan et al. (2017) for computation;

$$\begin{aligned} LiquidityCreation = 0.5 \times IlliquidAssets + 0.5 \times LiquidLiabilities - 0.5 \times LiquidAssets \\ -0.5 \times IlliquidLiabilities - 0.5 \times Equity \end{aligned} \tag{4}$$

The study also considered the assessment of market-based risk by using the standard deviation of stock returns. The yearly volatility of stock return has been calculated for each bank. It has been used as a proxy for measuring bank risk by Konishi and Yasuda (2004). To be concise the study has used five risk measures which are loan loss provisions, risk-weighted assets, and -Z-score all as a ratio of total assets, liquidity creation, and standard deviation of stock returns as proxies for measuring risk. A reduction in Z-score represents increased risk and for all other proxies an increase shows increased risk, to remove this confusion, Z-score has been multiplied by -1 so that a higher value indicates greater risk.

DATA ANALYSIS AND INTERPRETATIONS

Data Analysis

Table 2 shows the descriptive analysis of all study variables. This diagnostic shows that the integrity of the data is good and ready for further estimation. The total number of data or total observations is 213 for all variables. The mean of deposits, our main independent variable, is 0.759, showing that deposits account for nearly 76% of total wealth, while the value of the standard deviation is 0.083, showing the deviation of the data from the mean. Likewise, the median RWA is 0.535, showing that risk-weighted assets account for almost 54% of banks' total assets. The mean of the LLP and LCTA are 0.038 and 0.15, showing that on average banks hold 3% of the asset as a provision for loan losses, and 15% of the liquidity is created by assets. The correlation matrix in Table 3 shows the degree of association between explanatory and explained variables. Although some higher correlation coefficients raise the possibility of multicollinearity in the data, therefore we checked VIF and found it less than 5. As VIF was less than 5 and there is no correlation coefficient greater than ś 0.75, thus we conclude that there isn't any serious issue of multicollinearity in the data set.

Table 2: Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
BIG	0.282	0.000	1.000	0.000	0.451
DEP	0.759	0.767	0.909	0.469	0.083
EQUITY	0.089	0.079	0.298	0.016	0.043
GDP	4.151	4.675	5.701	1.607	1.267
HCB	0.225	0.000	1.000	0.000	0.419
HL	0.282	0.000	1.000	0.000	0.451
IBSP	1.756	2.590	3.080	0.000	1.266
INT	2.890	4.048	8.321	-5.079	4.259
INV_LNZ	-1.515	-1.536	0.182	-3.131	0.509
LCTA	0.159	0.158	0.293	0.032	0.051
LLP	0.038	0.034	0.139	0.006	0.024
LNTA	19.591	19.683	21.830	16.982	1.075
ROA	0.008	0.009	0.031	-0.047	0.010
RWA	0.535	0.524	0.855	0.000	0.121
SRV	0.275	0.215	1.239	0.006	0.209
Total Count	213	213	213	213	213

Note. BIG stands for BIG Bank, DEP stands for Deposits, EQUITY stands for Equity, EXR stands for Exchange Rate, GDP stands for the growth rate of Gross Domestic Product, HCB stands for High Capital Buffer, HL stands for High Deposits, IBSP stands for Inter Bank Spread, INT stands for Interest Rate, INV_LNZ stands for Inverse of Log Natural of Z-Score, LCTA stands for Liquidity Creation, LLP stands for Loan Loss Provisions, LNTA Log of Total Assets, ROA stands for Return on Assets, RWA stands for Risk-Weighted Assets, SRV stands for Stock Returns volatility.

Table 3: Correlation Matrix

	BIG	DEP	EQUITY	GDP	HCB	HL	IBSP	INT	INV_LNZ	LCTA	LLP	LNTA	ROA	RWA	SRV
BIG	1.00														
DEP	0.07	1.00													
EQUITY	0.09	-0.51	1.00												
GDP	-0.03	-0.08	-0.25	1.00											
HCB	0.04	-0.37	0.58	0.03	1.00										
HL	0.69	0.08	0.09	-0.03	0.04	1.00									
IBSP	-0.01	0.17	0.11	-0.42	0.00	-0.01	1.00								
INT	-0.02	0.06	-0.12	0.48	0.02	-0.02	0.15	1.00							
INV_LNZ	-0.19	0.15	-0.17	-0.20	-0.20	-0.16	-0.05	-0.23	1.00						
LCTA	-0.17	0.31	-0.60	-0.09	-0.54	-0.17	-0.08	-0.13	0.32	1.00					
LLP	-0.12	-0.04	0.10	-0.26	-0.12	-0.12	0.14	-0.09	0.43	0.20	1.00				
LNTA	0.49	0.18	-0.32	0.32	-0.18	0.59	-0.17	0.15	-0.25	-0.05	-0.11	1.00			
ROA	0.45	0.02	0.16	0.07	0.19	0.45	0.14	0.10	-0.52	-0.32	-0.42	0.52	1.00		
RWA	0.04	-0.02	0.18	-0.40	-0.16	0.04	0.11	-0.22	0.13	0.37	0.26	-0.27	-0.13	1.00	
SRV	-0.16	0.16	0.13	-0.36	-0.08	-0.17	0.22	-0.15	0.23	0.07	0.17	-0.43	-0.27	0.18	1.00

Note. BIG stands for BIG Bank, DEP stands for Deposits, EQUITY stands for Equity, GDP stands for Gross Domestic Product, HCB stands for High Capital Buffer, HL stands for High Liquidity, IBSP stands for Inter Bank Spread, INT stands for Interest Rate, INV_LNZ stands for Inverse of Log Natural of Z-Score, LCTA stands for Liquidity Creation, LLP stands for Loan Loss Provisions, LNTA Log of Total Assets, ROA stands for Return on Assets, RWA stands for Risk-Weighted Assets, SRV stands for Standard Deviation of Stock Returns.

Regression Results and Interpretation

Table 4: Liquidity and Bank Risk for all Banks

	Asset Risk			Overall Risk	
	RWA_t	LLP_t	-Z-scores	LC_t	SRV_t
C	2.057***	0.074**	-0.948	-0.197**	0.682*
	(7.506)	(1.945)	(-1.300)	(-2.004)	(1.729)
DEP_{t-1}	-0.078	0.033**	1.069***	-0.019	0.465**
	(-0.656)	(2.036)	(2.641)	(-0.442)	(2.196)
$LNTA_{t-1}$	-0.084***	-0.003*	-0.065**	0.015***	-0.041**
	(-6.571)	(-1.873)	(-1.908)	(3.259)	(-2.205)
$TLTA_{t-1}$	0.455***	0.019*	0.238	0.225***	-0.0038
	(5.734)	(1.736)	(0.818)	(7.889)	(-0.025)
$EQUITY_{t-1}$	-0.387**	-0.006	-1.243**	-0.189***	0.17096
	(-2.477)	(-0.268)	(-2.124)	(-3.369)	(0.568)
ROA_{t-1}	0.895	-0.780***	-15.965***	-0.141	-1.488
	(1.346)	(-8.455)	(-6.466)	(-0.588)	(-1.152)
R Square	0.659	0.774	0.296	0.689	0.064
Adj. *R* square	0.613	0.744	0.280	0.647	0.042
F Statistics	14.477	25.647	18.839	16.550	3.023
F-stat (prob)	0.000	0.000	0.000	0.000	0.000
Hausman *p* Value	0.000	0.000	0.004	0.004	0.004

Note. DEP stands for Deposits, EQUITY stands for Equity, INV_LNZ stands for Inverse of Log Natural of Z-Score, LCTA stands for Liquidity Creation, LLP stands for Loan Loss Provisions, LNTA Log of Total Assets, ROA stands for Return on Assets, RWA stands for Risk-Weighted Assets, SRV stands for Stock Returns Volatility. *, **, *** indicate the level of significance at 10%, 5% and 1% (two-tailed test) respectively. Moreover, if Hausman $p > 0.05$ then the random effects model otherwise fixed effect has been used.

For all banks (overall risk of the banks): In this panel regression, the study included bank-specific control variables, and to check causality all relevant tests were performed, including redundant fixed effects tests and correlated random effects - Hausman's test to decide between common fixed and random effects. The study first examines the impact of funding liquidity risk on overall risk as measured by Z-Score, LC, and SRV. The panel regression results presented in Table 4 show that there is a significant positive relationship between deposits and SRV. Similarly, the relationship between deposits and Z-score is also positive and highly significant. These results indicate that reducing the overall risk of funding liquidity from deposits increases the overall risk, consistent with the results of Khan et al. (2017) found that reducing funding liquidity risk through increased deposits increases the bank's risk appetite. The results agree with the results of Khan et al. (2017) and also the theoretical predictions of Acharya and Naqvis (2012). The coefficient value for z-score and SRV are 1.069 and 0.465, respectively, showing that a one-unit increase in deposits increases the bank's risk appetite by 1.069 units in terms of z-score and 0.465 units in terms of SRV. Therefore, in light of the results obtained from the regression, we can express the relationship between variables as follows;

$$RWA_{it} = \alpha - 0.084\left(L_{NTA_{it-1}}\right) + 0.455\left(TLTA_{it-1}\right) - 0.387\left(E_{QUITY\,it-1}\right) + \varepsilon_{it}$$

$$LLP_{it} = \alpha + 0.033\left(\text{ Dep }_{it-1}\right) - 0.003\left(LNTA_{it-1}\right) + 0.019\left(TLTA_{it-1}\right) - 0.780\left(ROA_{it-1}\right) + \varepsilon_{it}$$

$$-Z-\text{ score }_{it} = \alpha + 1.069\left(\text{ Dep }_{it-1}\right) - 0.065\left(\text{ LNTA }_{it-1}\right) - 1.243\left(\text{ EQUITY }_{it-1}\right) - 15.965\left(\text{ ROA }_{it-1}\right) + \varepsilon_{it}$$

$$LC_{it} = \alpha + 0.015\left(\text{ LNTA }_{it-1}\right) + 0.225\left(\text{ TLTA }_{it-1}\right) - 0.189\left(\text{ EQUITY }_{it-1}\right) + \varepsilon_{it}$$

$$SRV_{it} = \alpha + 0.465\left(\text{ Dep }_{it-1}\right) - 0.041\left(\text{ LNTA }_{it-1}\right) + \varepsilon_{it}$$

Asset risk of the bank: To examine the impact of funding liquidity risk on investment risk, the study used RWA and LLP. The panel's regression results showed that allowance for credit losses has a significantly positive relationship

with deposits at a significance level of 5%. Thus, an increase in deposits due to increased lending leads to an increase in loan loss provisions. An increase in deposits by one unit leads to an increase in risk provisioning by 0.3 units. The results showed that the natural logarithm of the total wealth of the LNTA has a positive relationship with the liquidity creation LC and a negative relationship with the rest of the others, i.e. H. RWA, LLP, -Z-Score, and SRV. It shows that an increase in total assets reduces risk-weighted assets by 8%, loan loss provisions by 3%, overall bank risk, represented by the -Z-score, by 6.5%, and volatility of shareholder returns by 4.1%. In addition, the Total Loan to Total Assets ratio maintains a significantly positive relationship with RWA, LLP, and LC and a significantly negative relationship with SRV. It turns out that the more banks lend, the greater the risk. Only stock return volatility shows the inverse relationship. Likewise, the ratio of equity to total assets maintains a significantly negative relationship with RWA, -Z-Score, and LC, showing that as equity increases, total risk and asset risk decrease. Similarly, return on assets also maintains a significantly negative relationship with LLP and Z-Score, showing that banks with high returns on assets have a lower risk.

Table 5: Liquidity and High capital buffer on banks' risk

	Asset Risk			Overall Risk	
	RWA_t	LLP_t	-Z-score	LC_t	SRV_t
C	1.153***	0.055	-1.276*	0.269***	1.801***
	(3.095)	(1.176)	(-1.741)	(3.823)	(5.417)
DEP_{t-1}	-0.017	0.034***	0.845	-0.064***	0.297
	(-0.077)	(2.833)	(1.258)	(-4.124)	(1.524)
Dep*HCB_{t-1}	-0.006	-0.085**	1.216*	-0.005	-0.281
	(-0.042)	(-2.074)	(1.900)	(-0.062)	(-0.747)
HCB_{t-1}	-0.029	0.051*	-1.051**	-0.003	0.061
	(-0.279)	(1.773)	(-2.203)	(-0.050)	(0.233)
$LNTA_{t-1}$	-0.040***	-0.002	-0.031	-0.004	-0.088***
	(-2.885)	(-1.106)	(-0.585)	(-1.306)	(-10.727)
$TLTA_{t-1}$	0.470***	0.007	-0.379**	0.215***	-0.060
	(14.946)	(0.554)	(-2.498)	(10.628)	(-0.284)
$EQUITY_{t-1}$	-0.224	0.077	0.559	-0.684***	-0.031
	(-0.615)	(1.327)	(0.844)	(-12.238)	(-0.058)
ROA_{t-1}	0.191	-0.614***	-21.147***	-0.534***	0.324
	(0.357)	(-5.684)	(-5.850)	(-2.408)	(0.349)
R Square	0.276	0.340	0.300	0.576	0.128
Adj. *R* Square	0.251	0.317	0.275	0.562	0.098
F Statistics	10.854	14.633	12.161	38.696	4.166
F-stat (prob)	0.000	0.000	0.000	0.000	0.000
Hausman *p* Value	0.001	0.001	0.001	0.001	0.001

Note. DEP stands for Deposits, EQUITY stands for Equity, HCB stands for High Capital Buffer, INV_LNZ stands for Inverse of Log Natural of Z-Score, LCTA stands for Liquidity Creation, LLP stands for Loan Loss Provisions, LNTA Log of Total Assets, ROA stands for Return on Assets, RWA stands for Risk-Weighted Assets, SRV stands for Stock Returns Volatility. *, **, *** indicate the level of significance at 10%, 5% and 1% (two-tailed test) respectively. Moreover if Hausman $p > 0.05$ then the random effects model otherwise fixed effect has been used.

High capital buffer banks The panel regression results of the regression results between funding liquidity risk measured by deposits and banks' capital buffer are shown in Table 5. The bank's capital buffer was calculated by HCB, which is a dummy variable. The HCB and deposit interaction term maintained a significantly negative relationship with LLP, showing that banks with high capital buffers have lower investment risk when they have low liquidity funding risk, as illustrated by the negative value of LLP. This relationship is significant at the 5% level of significance. A one-unit increase in deposits from banks with high capital buffers reduces loan loss provisions by 0.09 units. Similarly, it maintained a significantly positive relationship with the z-score, showing that increasing a bank's deposit with a high capital buffer increases its overall risk appetite. The relationship is significant at the 10%

level of significance. A one-unit increase in deposits from high-capital banks results in a 1.216-unit increase in the -Z-score. The dummy variable HCB is also significantly associated with LLP & -Z-Score, showing that an increase in capital buffer is associated with increased risk appetite, as shown by the positive value of the coefficient, which is significant at 10%, while showing that Bank's overall risk reduced as shown by the negative value of the Z-score coefficient. Therefore, banks with high capital buffers bear higher asset risk and lower overall risk.

Consequently, reducing funding liquidity risk together with HCB reduces the risk associated with assets, as shown by the negative sign of LLP, and increases overall risk, as shown by the positive value of the z-score. Large capital banks transfer less wealth risk compared to small capital banks. These results agree with the results of Khan et al. (2017) and Shim (2013) that banks with HCB are riskier in provisioning for defaults because increased capital acts as additional protection in the event of default. The result of the bank's overall risk, represented by the z-score, is consistent with the results of Jeitschko and Jeung (2005), who argued that managers of those banks that hold a high capital buffer take less risk with a high capitalization value. Other risk proxies, i. H. RWA, LC and SRV, show an insignificant relationship to this interaction term. When controlling for the high capital buffer, the deposit shows a significant positive relationship with the LLP and a negative relationship with the LC with coefficient values of 0.034 and -0.064, respectively. Both values are significant at a significance level of 1%. It shows that a one-unit increase in deposits increases investment risk by 0.034 units and reduces overall risk as reported by LC by 0.064 units, with the capital buffer remaining constant.

Table 6: Liquidity and BIG Banks on banks risk

	Asset Risk			Overall Risk	
	RWA_t	LLP_t	-Z-score	LC_t	SRV_t
C	1.579***	0.039	-0.690	-0.123*	0.868*
	(6.820)	(1.135)	(-0.888)	(-1.911)	(1.948)
DEP_{t-1}	-0.139	0.015	1.331***	0.008	0.501**
	(-1.148)	(0.850)	(3.161)	(0.265)	(2.123)
Dep*Big_{t-1}	-0.037	0.037	-1.803***	-0.076**	-0.200
	(-0.131)	(0.935)	(-1.699)	(-2.077)	(-0.358)
Big_{t-1}	0.168	-0.021	1.519***	0.032	0.219
	(0.752)	(-0.674)	(1.813)	(1.071)	(0.493)
$LNTA_{t-1}$	-0.061***	-0.001	-0.091**	0.010**	-0.052**
	(-5.399)	(-0.589)	(-2.402)	(1.999)	(-2.398)
$TLTA_{t-1}$	0.536***	0.024**	0.245	0.245***	-0.020
	(7.000)	(2.240)	(0.847)	(9.754)	(-0.12)8
$EQUITY_{t-1}$	-0.408***	-0.004	-1.238**	-0.284***	0.156
	(-2.656)	(-0.188)	(-2.145)	(-5.589)	(0.512)
ROA_{t-1}	0.705	-0.838***	-16.321***	-0.533**	-1.497
	(1.090)	(-9.204)	(-6.721)	(-2.527)	(-1.141)
R Square	0.363	0.348	0.324	0.446	0.068
Adj. *R* Square	0.343	0.328	0.302	0.429	0.038
F Statistics	18.067	16.962	15.187	25.569	2.290
F-stat (prob)	0.000	0.000	0.000	0.000	0.000
Hausman *p* Value	0.000	0.000	0.000	0.000	0.000

Note. BIG stands for BIG Bank, DEP stands for Deposits, EQUITY stands for Equity, INV_LNZ stands for Inverse of Log Natural of Z-Score, LCTA stands for Liquidity Creation, LLP stands for Loan Loss Provisions, LNTA Log of Total Assets, ROA stands for Return on Assets, RWA stands for Risk-Weighted Assets, SRV stands for Stock Returns volatility. *, **, *** indicate the level of significance at 10%, 5% and 1% (two-tailed test) respectively. Moreover if Hausman *p*>0.05 then the random effects model otherwise fixed effect has been used.

Big banks: The results of the panel regression of the banks with the dummy variable "Big" and the interaction term "Big" with deposits are presented in Table 6. This dummy variable "Big" is defined by the banks in the top quartile concerning the bank's total assets. The interaction of big and deposit maintained a significantly negative relationship to z-score and LC at significance levels of 1% and 5%, respectively, showing that big banks have

lower overall risk. A one-unit increase in deposits from major banks reduces the Z-score by 1.803 and the LC by 0.076 units. The dummy variable large also maintained a significant positive relationship – z-score, showing that a one-unit increase in banks' total assets is associated with an increase in risk appetite by 1,529 units, as evidenced by the positive value of the coefficient, which is significant at 1%. Large banks become safer when they have large deposits. Furthermore, due to their size, they are systematically becoming more important banks and are therefore heavily regulated. These results are somewhat relevant to the results of Khan et al. (2017), De Haan and Poghosyan (2012) showing a negative relationship between the interaction term to overall risk and a weaker relationship to one of the asset risk proxies. When the control for the dummy variable is large, the deposit shows a significant positive relationship to the z-score and stock return volatility. It shows that a one-unit increase in deposits increases overall bank risk by 1.337 units and volatility in stock returns by 0.501 units, while size remains constant. So while controlling the size of the bank, increasing deposits increases the volatility of stock returns and the bank's overall risk.

Table 7: Validity, Reliability and VIF

	Asset Risk			Overall Risk	
	RWA_t	LLP_t	-Z-score	LC_t	SRV_t
C	0.856***	-0.044	-1.314*	0.011	-0.006
	(3.449)	(-1.087)	(-1.714)	(0.182)	(-0.014)
DEP_{t-1}	-0.171	0.009	1.433***	-0.001	0.355*
	(-1.484)	(0.584)	(3.454)	(-0.040)	(1.891)
$LNTA_{t-1}$	-0.015	0.004*	-0.041	0.002	0.011
	(-1.160)	(1.845)	(-1.035)	(0.822)	(0.464)
$TLTA_{t-1}$	0.485***	0.023*	-0.139	0.253***	-0.157
	(5.802)	(1.954)	(-0.447)	(9.325)	(-0.978)
$EQUITY_{t-1}$	-0.276*	-0.009	-0.655	-0.324***	0.287
	(-1.683)	(-0.402)	(-1.073)	(-6.029)	(0.912)
ROA_{t-1}	0.619	-0.892***	-14.419***	-0.497**	-2.253**
	(0.931)	(-9.688)	(-5.844)	(-2.303)	(-1.736)
$IBSP_{t-1}$	-0.001	0.002**	-0.069***	0.001	0.007
	(-0.231)	(2.126)	(-3.048)	(0.551)	(0.613)
INT_{t-1}	0.000	0.000	0.000	-0.001	0.000
	(0.235)	(-1.110)	(-0.011)	(-0.869)	(-0.018)
GDP_{t-1}	-0.024***	-0.002**	-0.039	0.006***	-0.045**
	(-3.209)	(-2.006)	(-1.499)	(2.767)	(-3.223)
R Square	0.370	0.393	0.325	0.421	0.133
Adj. *R* square	0.347	0.371	0.301	0.400	0.101
F Statistics	16.238	17.904	13.321	20.062	4.200
F-stat (prob)	0.000	0.000	0.000	0.000	0.000
Hausman *p* Value	0.000	0.000	0.000	0.000	0.000

Note. DEP stands for Deposits, EQUITY stands for Equity, IBSP stands for Inter Bank Spread, GDP stands for a growth rate of gross domestic product, INT stands for Interest Rate, INV_LNZ stands for Inverse of Log Natural of Z-Score, LCTA stands for Liquidity Creation, LLP stands for Loan Loss Provisions, LNTA Log of Total Assets, ROA stands for Return on Assets, RWA stands for Risk-Weighted Assets, SRV stands for Stock Returns volatility. *, **, *** indicate the level of significance at 10%, 5% and 1% (two-tailed tests) respectively. Moreover if Hausman $p >$ 0.05 then the random effects model otherwise fixed effect has been used.

Macroeconomic factors: To check the robustness of the results, the study also includes some macroeconomic variables as control variables to examine the relationship between funding liquidity risk and banks' risk appetite. The study considers the growth rate of GDP, the interbank deposit spread and the interest rate, after following the literature that widely uses these variables as macroeconomic variables influencing bank risk appetite (Chaibi & Ftiti, 2015; Mare, 2015; Dell 'Ariccia et al., 2017; khan et al., 2017; Mpofu & Nikolaidou, 2018). The regression results with these macroeconomic factors are presented in Table 7. The results showed that in the presence of these

macroeconomic variables, an increase in deposits increases the bank's overall risk as indicated by the Z-score and the volatility of stock returns. In the presence of macroeconomic variables, a one-unit increase in deposits increases the total risk z-score by 1.433 units and the stock return volatility by 0.355 units. Both variables are significant at a significance level of 1% and 10%, respectively. IBSpread has a significantly positive relationship with LLP and a significantly negative relationship with Z-Score. An increase in interbank spread increases investment risk while reducing overall risk, as shown by the negative Z-Score value. While GDP has a significantly positive relationship with RWA LC and SRV and a significantly negative relationship with LLP and z-score. These results are relevant to the proposed hypothesis, except for the interest rate, which shows no significant association with risk-taking proxies. Thus, the increase in GDP and IB spread reduces banks' risk appetite. A high value of the interbank spread indicates high costs of the funds and thus reduces the managers' overall risk tolerance.

Table 8: Liquidity and Bank Risk in Banks having High Deposits

	Asset Risk			Overall Risk	
	RWA_t	LLP_t	-Z-score	LC_t	SRVt
C	1.521***	0.034	-0.680	-0.114*	0.856*
	(6.606)	(0.999)	(-0.887)	(-1.795)	(1.939)
DEP_{t-1}	-0.166	0.013	1.308***	0.008	0.495**
	(-1.386)	(0.778)	(3.149)	(0.227)	(2.115)
Dep*HL_{t-1}	0.066	0.048	-2.022*	-0.066	-0.240
	(0.216)	(1.124)	(-1.778)	(-0.669)	(-0.396)
HL_{t-1}	0.050	-0.034	1.692*	0.027	0.243
	(0.208)	(-0.997)	(1.891)	(0.349)	(0.508)
$LNTA_{t-1}$	-0.056***	-0.001	-0.090**	0.010***	-0.052**
	(-5.094)	(-0.386)	(-2.451)	(3.377)	(-2.408)
$TLTA_{t-1}$	0.543***	0.024**	0.258	0.244***	-0.014
	(7.076)	(2.266)	(0.892)	(9.746)	(-0.093)
$EQUITY_{t-1}$	-0.394***	-0.004	-1.23**	-0.291***	0.159
	(-2.606)	(-0.183)	(-2.144)	(-5.723)	(0.524)
ROA_{t-1}	0.737	-0.839***	-16.376***	-0.557***	-1.465
	(1.135)	(-9.193)	(-6.756)	(-2.649)	(-1.115)
R Square	0.355	0.348	0.328	0.450	0.068
Adj. *R* Square	0.335	0.327	0.307	0.433	0.038
F Statistics	17.463	16.899	15.463	25.987	2.293
F-stat (prob)	0.000	0.000	0.000	0.000	0.000
Hausman *p* Value	0.000	0.000	0.000	0.000	0.000

Note. DEP stands for Deposits, EQUITY stands for Equity, HL stands for High Liquidity, INV_LNZ stands for Inverse of Log Natural of Z-Score, LCTA stands for Liquidity Creation, LLP stands for Loan Loss Provisions, LNTA Log of Total Assets, ROA stands for Return on Assets, RWA stands for Risk-Weighted Assets, SRV stands for Standard Deviation of Stock Returns. *, **, *** indicate the level of significance at 10%, 5%, and 1% (two-tailed test) respectively. Moreover if Hausman $p > 0.05$ then the random effects model otherwise fixed effect has been used.

Banks with high deposits - To further verify the robustness, the study extended the analysis to include another dummy variable HL, showing the bank's liquidity in relation to large deposits. The results of the regression with interactions with high deposits are presented in Table **??**. The interaction of HL and deposits maintained a significantly negative relationship with the -Z score, showing that banks with high deposits have lower overall risk, represented by the negative value of -Z-. Score. This relationship is significant at the 10% level of significance. The dummy variable HL is also significantly associated with the -Z-score, showing that an increase in liquidity is associated with increased risk-taking, as evidenced by the positive value of the coefficient, which is significant at 10%. When controlling liquidity, the banks with higher deposits show a higher overall risk as represented by the positive value of Z-Score and SRV. Both are significant at a significance level of 1% and 5%, respectively. Thus, the lower funding liquidity risk in the presence of an interaction period increases the risk appetite of the bank. According to the predictions of Acharaya and Naqvis (2012) and the empirical results of Khan et al. (2017).

CONCLUSION

This study examined the impact of funding liquidity risk on banks' risk behavior. The data was collected from 23 banks listed on the Pakistan Stock Exchange for the period of ten years, i.e. H. from 2009 to 2018, surveyed Banks have increased risk appetite. The study assumes that banks with large deposits take on more risk as the deposits act as a buffer to avoid the risk of "Run". The results show that increasing deposition leads to an increase in LLP, -Z-score and SRV. The reduction in funding liquidity risk thus increases the Bank's overall risk appetite. This finding is supported by previous research conducted by Khan et al. carried out in the developed economy. The interactive notion with capital buffer showed that the banks with high capital buffer have higher asset risk as shown by LLP and lower overall risk as represented by z-score. Furthermore, the interactive term with large banks showed that as the bank size increases, the bank's overall risk decreases, as shown by the z-score. Therefore, large banks take fewer risks compared to small banks. In addition, highly liquid banks also reduce their risk appetite. The study has some practical implications for both policymakers and economic users. Furthermore, given the sector's importance to the domestic economy, this study will help regulators and monetary authorities in making strategic decisions to limit managers' risk-taking. In addition, it offers opportunities to improve funding sources by properly matching them to the use of funds. In addition, a clear understanding of the factors influencing banks' risk-taking behavior is necessary for regulators to further strengthen the banking system, which is the backbone of the economy. Despite severe limitations in terms of data availability and time constraints, efforts have been made to conduct this study appropriately. Although this research gives good and effective results in favor of most of the contemporary research already done. This study left other dimensions that may have been considered. The study only looked at the banking sector as a sample with 10-year annual data. Further studies can be carried out on the entire financial sector. In addition, twenty-year data can be used to perform a sensitivity analysis to review fluctuations in the banking sector's risk appetite. There could be more explanatory variables, but the study only considered deposits due to time constraints.

The results of this study have policy implications for banking sector regulators. For example, regulators must encourage higher liquidity and capital requirements for banks. Thus would increase customers' confidence in commercial banks by reducing danger of bank run and disciplining risk taking behavior of banks.

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