



The influence of Liquidity risk and Credit risk on Bank Stability: A Case of Pakistan

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Abstract

This study investigates the impact of two major sources of bank risk: Liquidity risk and Credit risk on the stability of the banks. We use a sample of commercial banks during the period 2002–2016 to analyze how this relationship influences banks' stability. The results obtained revealed that Liquidity risk have a significant and positive and credit, risk have no effect on the stability of the banks in case of Pakistan.

Keywords: Liquidity risk, credit risk, bank stability

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I. Introduction

The banking sector has a vital role in the economic and financial development of a country. Financial performance of a bank shows its ability to make new resources, from day-to-day operation over a given period and it assessed by net income and cash flow from operations. Therefore, assessing the performance of banking institutions is a vital process and necessary for the persistence of banks' activities, to meet the changes and continuing challenges. Banking sector faces serious consequences when the different type of financial risks such as liquidity risk, and credit risk are not properly managed. In principle, there are two formal types of risk in the financial market. The first one is systematic risk and the other one is the unsystematic risk. The financial risk measured and analyzed as one of the determinants of banks' profitability. It has been identified based on existing studies that financial different types of risk and an increased level of total risk have negatively influenced performance of commercial banks may lead towards the banking crises (Maaka, 2012). Bank size also plays a significant role in determining the exposure of these risks for banks (Aggarwal & Jacques, 2001; Jacques & Nigro, 1997; Shrieves & Dahl, 1992; Stolz, Heid, & Porath, 2003; Van Roy, 2003). It is a requirement of central bank to keep specific amount as cash reserve to maintain liquidity. Central bank regulation sets the minimum fraction of customer deposits as reserve that each commercial bank must hold rather than lend out (Sohaimi, 2013). Every bank tries to keep up sufficient funds to fulfill the requirement and meet the unexpected demands from depositors. The liquidity risk can be mitigated by maintaining sufficient cash reserves but maintaining the cash is extremely expensive because it decreases the level of short-term investments that the firm can make (Maaka, 2013).

Results converge and show that the liquidity risk and the interaction between credit risk and liquidity risk exert a negative and significant effect on bank stability. Ghenimi et al. (2017) studied the effects of liquidity risk and credit risk on bank stability using 49 banks belonging to eight countries of the MENA region over the period 2006-2013. They found that credit risk and interaction between both risks contribute to bank instability. The current vield of knowledge lacks research on the joint effects of liquidity and credit on the bank stability and performance while taking into account the size of bank, this study aims to fulfill this gap by testing the association of these risks with the financial performance of commercial banks in context of Pakistan. We find no study that examines the effects of these risks jointly on Bank Stability of banks, specifically in case of Pakistan. In this research study, we evaluate the financial performance of Pakistani banking sector, which has developed rapidly in last two decades

II. Literature Review and Hypothesis Development

From a theoretical perspective, the relationship between liquidity risk and credit risk seems to be clearly established. Now the question arises that how are banks affected by this relationship in their overall risk structure? Studies such as Meyer and Pfifer (1970), Espahbodi (1991), Thomson (1991), Cole and Fenn (1995) and Shin and Caputo (2002) show that a bank's default risk is mainly driven by low earning over-exposure to certain categories of loans, and excessive loan defaults. Generally, they find that excessive investment banking activities, bad macroeconomic conditions in the banks' immediate vicinity, low equity, and heavy concentrations in commercial real estate loans substantially increased banks' probability of default. Interestingly, all these studies provide clear evidence that credit risk and Liquidity risk plays a vital part for the overall stability condition of a bank. Wagner (2007) also illustrated that increase in liquidity of banks can heighten the risk of instability in the banking system. He argued that even though banks are benefited from more liquidity in assets with reference to stability, distresses turn out to be less expensive for banks, therefore they more likely not to avert them from happening.

A more direct channel of how liquidity and credit risk can jointly cause default is theoretically shown by He and Xiong (2012b). They analyze the relationship between liquidity and credit risk from a company's wholesale funding perspective. Cole and White (2012) and Berger & Bouwman (2013) focused on bank defaults in the course of financial distress. The channel they identify which connects liquidity risk to credit risk and ultimately with default risk is debt rollover risk. The results of the study show that investors demand higher illiquidity premia for corporate bonds due to liquidity risk in the market of those bonds. Hence, based on the evidence enlisted above it may be assumed that joint occurrence of liquidity and credit risks may have been a causal factor for bank defaults specifically in the times of a financial crisis. There are several studies such as (Jemison, 1987; Iannotta, Nocera, & Sironi, 2007; Beccalli, 2007) have examined the financial risks, which are credit risk, and liquidity risk related to the earnings response of commercial banks and its effects on the stock returns. There are also a few number of studies about analyzing liquidity risk (Akhter et al., 2011; Arif & Anees, 2012; Tabari et al., 2013) and credit risk (Miller & Noulas, 1997; Poudle, 2012; Ogboi & Unuafe, 2013; Ali et al., 2016; Shahbaz et al., 2016), with respect to financial performance of banks. Therefore, it might be possible that credit risk and liquidity risk may be a posed a serious threat for bank stability. It will lead us to the following hypothesis:

H₁: Liquidity risk and credit risk jointly affect the banks' stability.

III. Data and sample selection

To analyze the impact of liquidity and credit risk on bank stability, the sample for this study will be 11 commercial banks and 4 public banks of Pakistan. The selected sample of 15 banks is based on large capitalization. These are renowned commercial banks of Pakistan. The year pattern, which has considered in the study for the evaluation of bank stability on the operation of banks in Pakistan, are covering the period from 2002 through 2016.

IV. Methodology and Estimation Technique

There are two main variables to measure the risk: First measure is the liquidity risk, and second one is the credit risk. For the purposes of this study, we call the liquidity proxy variable liquidity risk (LR) for credit risk; we observe the credit risk (CR) variable shown in Table 1. The liquidity risk (LR) variable calculated by subtracting the volume of all assets, which the bank can quickly, and at low cost turn into cash at fair market value. To cover possible short-term withdrawals from the volume of liabilities this can be withdrawn from the bank on short notice. While credit risk (CR) variable will calculated by dividing the average net loan losses (loan charge-offs minus loan recoveries) in the current year by the average loan loss allowance recorded in the previous year

Table 1: Bank liquidity risk and credit risk proxy variables

<i>Proxy</i>	<i>Calculation</i>
Liquidity Risk (LR)	$\frac{[(Demand\ Deposits + Transaction\ Deposit + Brokered\ Deposits + Unused\ Loan\ Commitments) - (Cash + Currency\ \&\ Coin + Trading\ Commercial\ Paper\ Securities\ available\ for\ Sale) \pm Net\ Inter-Bank\ Lending\ Position \pm Net\ Inter-Bank\ Acceptances / Total\ Assets]}{}$
Credit Risk (CR)	$\frac{Loan\ Charge - Offs_t - Loan\ Recoveries_t}{Loan\ Loss\ Allowance_{t-1}}$ <i>Offs_t = written off as uncollected by bank</i>

The Z-score is used as a measure of overall bank risk. The Z-score which is consider as bank stability proxy measures the number of standard deviation of bank's return on assets has decrease from its expected value before the bank is insolvent because equity is depleted Roy (1952). The Z-score as the ratio of the sum of the return on assets (ROA) and the capital ratio, divided by the standard deviation of the return on assets.

$$Bank\ Stability_{i,t} = \ln\left(\frac{ROA_{i,t} + CR_{i,t}}{SD(ROA_{i,t})}\right)$$

$ROA_{i,t}$ = Return on Assets

$CR_{i,t}$ = Capital Ratio

$SD(ROA)_{i,t}$ = Standard Dev. Return on Assets

The capital ratio is calculated as the ratio of total equity to total assets. Moreover, do both risks jointly have an impact on banks' stability? The lack of an economically meaningful relationship between the two risk types might be an indication of a lack of joint management of these risks in banks. If it seems true, we should find a joint (unmanaged) increase in liquidity risk and credit risk contributes strongly to banks' stability. As we stated in our hypothesis, to test this in an empirical setting and to obtain a deeper understanding of the inner workings of liquidity risk and credit risk in banks. We run multivariate logistic regression model using this sample of banks of irrespective of default and non-default banks. Therefore, we developed our multivariate regression model as follow

$$Bank\ Stability_{i,t} = \beta_0 + \beta_1 CR_{i,t} + \beta_2 LR_{i,t} + Control\ Variables_{i,t} + \epsilon_{i,t} \quad (1)$$

A multivariable model can be thought of as a model in which multiple variables are found on the right side of the model equation. This type of statistical model can be used to attempt to assess the relationship between a number of variables; one can assess independent relationships while adjusting for potential confounders. A simple linear regression model has a continuous outcome and one predictor, whereas a multiple or multivariable linear regression model has a continuous outcome and multiple predictors (continuous or categorical). In the regressions we control for bank characteristics and include the log of total assets, the capital ratio, the return on assets, the standard deviation of the (ROA), the efficiency ratio, bank loan growth, commercial to total loans and individual to total loans. The control variables are based on e.g. Cole and Gunther (1995, 1998), Cole and White (2012), Beltratti and Stulz (2012).

V. Empirical Results and Discussion

Table 2: Descriptive Statistics

Variables	Mean			Median			Std. Dev.		
	Small Banks	Large Banks	All Banks	Small Banks	Large Banks	All Banks	Small Banks	Large Banks	All Banks
Banks									
Liquidity Risk (LR)	0.59	0.61	1.2	0.56	0.56	1.12	0.19	0.18	0.37
Credit Risk (CR)	0.51	0.51	1.02	0.49	0.51	1	0.17	0.18	0.35
Z-score	1.69	2.85	4.54	1.19	2.82	4.01	1.47	1.85	3.32
Capital Ratio	0.14	0.14	0.28	0.12	0.13	0.25	0.07	0.03	0.1
Return on Assets (ROA)	0.01	0.02	0.03	0.00	0.02	0.02	0.02	0.03	0.05
Standard deviation (ROA)	0.03	0.03	0.06	0.02	0.02	0.04	0.01	0.01	0.02

This section is associated with the combine effect of liquidity risk and credit risk on the bank's stability and it is alien with the hypothesis of this study. "Liquidity risk and credit risk jointly affect the banks' stability". For this purpose, the variables are being analyzed by using the multivariate logistic regression model. It has assumed that there is need to check the probability factors for the individual risk with reference to control variables. Tables 5.9 demonstrations the combine impact of liquidity risk and the credit risk on the stability of the bank with 95% confident interval. The value of coefficient in regression show that how much change occurs in dependent variable because of the one unit change in the independent variable. In table 5.10, the negative value of coefficient of liquidity risk indicates that there is a negative or inverse relationship between liquidity risk and banks stability. Whereas the positive sign of the coefficient of credit risk show a direct and positive relation between bank's stability and credit risk. However, when we talk about the predictor value or p-value, the change in the p-value indicates the change in the retort variables.

Table: 2 Combine effect of Liquidity risk and credit risk on banks' stability

Bank Stability	Coef.	Std. Err.	T	P>t
Liquidity Risk (LR)	-0.036364	0.684693	-0.05	0.958
Credit Risk (CR)	1.432708	0.735543	1.95	0.053
Return on Assets	29.8921	4.001047	7.47	0.000
log Total Asset	-0.050711	0.123053	-0.41	0.681
S.d.RoA	-211.7659	9.953578	-21.3	0.000
Capital Ratio	53.55461	2.568029	20.85	0.000
Cons	4.9351	2.720512	1.81	0.072

The highest value of p (greater than 0.05) indicates that the change in the one variable (independent variable) is not associated with the change in the other variable (dependent variable). As the results of the regressions shows that the liquidity ratio have p-value 0.053, which means that credit, risk have no effect on the stability of the banks. Whereas the liquidity risk have p-value 0.958, which is almost equal to the limit of the predicted value, and it indicates that liquidity risk have a significant and positive impact on the stability of the banks. As demonstrated in the study of Imbierowicz & Rauch (2014), in which they estimated the default probability of the bank because of liquidity risk and credit risk between 10% to 30% and mitigation of risk is estimated with default probability of 70-90% in the conclusion of their research work. Thus according to the results of regression analysis it is analyze that the third hypothesis **H3**: "Liquidity risk and credit risk jointly affect the banks' stability" has partially accepted.

Besides this, study conducted by Ndifon Ejoh, Inah Okpa and Ebong Inyang (2014) analyzed the impact of liquidity risk and credit risk as a joint risk effecting the performance of the banks. They find that there exist a significant impact of joint effect of liquidity risk and credit risk on the stability of bank. Gatev and Strahan (2009) also find in their study that liquidity risk and credit risk has joint effect on the stability of the bank and have potential

influence if they occur jointly, than individual influence these risk still have probability of their occurrence to cause the crisis in the bank. With the image of individual influence these risk still have probability of their occurrence to cause the crisis in the bank. Many scholars has also emphasized the period of financial crisis in their sample data and research work to provide the keen analysis. However, there was no major financial crisis on the banking level in the Pakistan in near past so in this study period of financial crisis has not been considered as a mandatory scenario and all the sample data has been investigated on smooth flowing financial statements over years and hypothesis has been tested according the stable conditions.

VI. Conclusion

The hypothesis that has been designed is to examine whether these two types of risk jointly affect the stability of banks in Pakistan and it is also investigated what were the banks stability during the duration of 2002-2016. This assumption of the study investigated the effect and probability of the failure of operational performance of the bank. To calculate the finding and to utilize the sample data multivariate logistic regression model has been considered and probability is calculated by considering the different directions. To avoid the hurricane of the microeconomics and macroeconomics unstable condition probability has been considered as the malfunction of banks operational performance by using the multivariate logistic regression model. The model has provided us with the coefficient of variables, standard errors of variables, time lag of variables, and probability with the impact of time of variables and interval confidence of variable. To identify the interval confidence 95% ratio has been taken into account for the findings. By viewing the statistic, the lag odds, which have been obtained, indicated the high probability of default of banks because of the liquidity risk which is up to 95% where credit risk is indicating the probability of 5% to fail the bank in its performance. The credit risk is also playing its role in the statistics of coefficient. Where there is the probability of the liquidity irks is high, the standard error figure is also high with 0.684693 but standard deviation of the return on assets is concluding the highest standard deviation error in the finding. The interval confidence with 95% limit of lag odds has been at highest level of 58 as upper limit and 48 as lower limit in the findings. Return on assets is also indicating the high absolute value for the interval confidence 37 as upper limit and 21 as lower limit. Log of the total assets is also containing the high probability of occurrence up to the 68% in the statistical findings of the different variables after utilizing the multivariate logistic regression model. It has been witnessed by the empirical finding, is that liquidity risk has high chances of the occurrence to cause the default of banks in Pakistan. Whereas the credit risk is also having the association with the equity management and return on assets and can affect the operational factor regarding the performance of the banks in Pakistan as according to literature. However, the basic scenario is liquidity risk management that is associated with the assets quality and supply in the market and cause the effective effect pattern in the equity dealing. The study analyze that there should be mixed approach to mitigate or transfer the risk of bank failure in the banking markets of Pakistan.

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