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RELATIONSHIP BETWEEN BANK CAPITAL AND LIQUIDITY CREATION: A Disaggregated Analysis of Banking Industry of Pakistan

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Abstract

This study aims to explore the impact of bank capital on liquidity creation in Pakistan by using dataset of the scheduled banks of Pakistan, (under the State Bank of Pakistan) from 2004 to 2013. The analysis is based on various classifications of the banks; i.e., overall, small, medium and large. Using Generalized Least Squares (GLS) model, the results show a positive relationship between the desired variables for large banks and negative for small and medium banks. Hence, these findings confirm that the hypothesis of 'risk absorption' effects dominate the large banks and 'financial fragility' hypothesis governs in case of small and medium size banks. Moreover, banks' liquidity is positively related to bank governance measures and negatively with the bank-size variable. On the other hand, bank risks' measures are positively connected to liquidity creation. On the basis of findings of this study, it is suggested that if regulatory authorities set higher capital requirements for banks, it may result in greater liquidity creation by large banks but it can restrict the liquidity creation by small banks.

Key Words: Liquidity Creation, Bank Capital, Financial Institutions, Risk, Banks, Regulations.
JEL Classification: O16, D81, G21, G38.

I. Introduction

According to the financial intermediation theory there are two major functions that banks performs in an economy. These are: (1) Liquidity creation, and (2) Risk transformation. Banks can generate liquidity, either with off-balance-sheet by funding fixed assets with current liabilities, as proposed by Kashyap, et al. (2002) or by claims to short-term fund and loan committments. On the other side, risk transformation theory states that banks transfer risk by selling risk-free deposits to fund their risky advances [Diamond (1984) Boyd and Prescott (1986)]. In short, banks have ability to minimize their risk by funding their long-term liabilities with short-term assets [Rama and Thakor (1984)].

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Liquidity creation and risk transformation may occur together, when banks issue risk-free liquidity on short-term deposits to finance their risky long-term advances. Despite this, risk transformation and liquidity creation do not move back and forth. The amount of liquidity creation may be significantly different for a specified amount of risk transformed. The liquidity creation increases the risk for banks [Allen and Santomero (1998)]. Allen and Gale (2004) stated that greater the banks create liquidity, the greater the chance of losses related to convert long-term assets to fulfill customers' liquidity needs. Bank capital has risk absorption ability as it increases the bank's capacity of risk bearing [Repullo (2004)]. Thus, a greater bank capital ratio may permit banks to generate more liquidity. Collectively, these set of views are known as 'risk absorption' effects. However, some contributions on liquidity creation theories suggest that bank capital may slow down the liquidity creation by making bank's capital less fragile [e.g., Diamond and Rajan (2001), Lei and Song (2013)]. Banks with fragile capital structure have to monitor their borrowers and hence, allow to extend advances. Additional capital makes it difficult for less fragile bank to monitor its borrowers, which in turn impede the bank's ability to create more liquidity. Bank capital may decrease liquidity creation because it 'crowds out' bank deposits [e.g., Gorton and Winton (2000)]. Berger and Bouwman (2009) unite both these theories as 'financial fragility crowding out' hypothesis.

Banks vary in size, i.e., small, medium and large. Often it is assumed that 'financial fragility' effect would robust comparatively for small banks. The reason for this expectation is that usually small banks do business with small-scale companies where they need to keep an eye on their borrowers [Diamond and Rajan (2001)]; but, on the other hand one reason can be that these banks locally raise funds, and in this way bank capital can 'crowd out' deposits of a bank [Gorton and Winton (2000)]. This effect is expected to be weak for medium and large banks, because these banks raise funds both from local or global financial markets. The 'risk absorption' hypothesis is expected to be strong for large banks because they have greater market discipline and regulatory scrutiny than the small banks. Greater regulatory enquiry and market discipline may affect their risk absorption capacity.

The role of banks as risk converters has been discussed in the past literature but the focus of studies about banks' role as liquidity creators has not yet been properly conversed. In case of Pakistan, there is no empirical evidence which have addressed this role of banks. Second, in Pakistan, no research is available which clearly discuss the effect of bank capital on liquidity creation, considering different sizes of banks. To examine the policy related matters, such as the impact of bank capital on liquidity creation in Pakistan, it is not possible to answer the questions mentioned above, without any measure of liquidity creation. Therefore, the present study attempts to calculate liquidity volume in Pakistani banks (of various size) using the methodology presented by Berger and Bouwman (2009). This is one of the preferred measures to find the answer to the question, whether there exist any significant relationship between bank capital and liquidity creation for small, medium and large banks. This analysis will help to know whether the data supports the hypotheses of financial fragility or the fi-

nancial absorption in case of banking industry of Pakistan. Such findings can guide the policy makers to design proper policies for macro-economic stability because (many times) economists have observed the bank liquidity creation as a major source of inflationary pressure in economy [Friedman (1968)]. The proceeding Section II explains the past literature highlighting various related aspects of banking industry y. Section III sheds light on hypothesis of the study. Methodology is explained in Section IV, following Conclusion and recommendations in Section V.

II. Literature Review

A glimpse of past literature, given below explains the relationship between the two desiring variables, i.e., liquidity creation and the bank capital. Xie (2016) investigated the nexus between liquidity and the bank capital for China's economy. Using the dataset of 28 banks and time period from 2004 to 2014, the study observed different results for different banks. Three variants of banks were used, i.e., state-owned banks, national shareholding commercial banks and the regional commercial banks. In case of first category, the empirics showed no association between these two variables. For the second type of banks, there existed positive relation with each other, and in case of last category of banks, the nature of relationship turned to be negative. Berger, et al. (2016) found the impact of regulatory involvements and bank capital on liquidity creation. The authors used the dataset of all banks working in Germany and found that regulatory involvement decreases the bank liquidity creation as the objective of these involvements is to moderate the risk taking of banks and to continue safe and smooth operations. However, the findings suggested that such interventions did not affect much the liquidity creation on assets side but generate strong impact on liability side of the balance sheet.

Fungacova, et al. (2015) described as to how the liquidity creation increased the chances of bank failures in Russia, during 1999 to 2009. The results showed that small banks create more liquidity and concluded that high liquidity creation may increase the probability of bank failure. The findings suggested that regulatory authorities can reduce chances of bank's failure through timely identification of higher liquidity creators and improve monitoring on bank's funding, and the investing activities. Horvath, et al. (2014) studied the causal relation between bank capital and liquidity creation, using dataset of Czech banking industry from 2000 to 2010. The findings showed a negative association between bank capital and liquidity creation and also found that larger liquidity creation can have an unfavorable impact on bank solvency. The findings supported the view that higher capital requirement can decrease liquidity creation. Lei and Song (2013) studied the influence of bank capital on liquidity creation in China using dataset of all banks for the time period 1988 to 2009. The authors investigated, both the 'financial fragility' effects and the 'risk absorption' effects on commercial banks of China and found negative relationship between capital and liquidity creation and the weaker relationship for foreign banks in china, which supports the 'risk absorption' effect.

Fungacova, et al. (2012) focused on relationship between the bank capital and liquidity creation by studying as to how the bank deposits affect this link. Negative association between capital and liquidity creation was found before and after implementation of deposit insurance scheme in Russia, in 2004. The results observed were same in both the scenarios. However, the nature of relationship between both the desired variables was sensitive to the structure of ownership and bank size. The relationship was strongly negative for small, medium and the domestic banks; but it was insignificant for foreign, large and government banks. Berger and Bouwman (2010) observed the effect of US monetary policy on bank liquidity creation during the financial crisis, normal period and the bank size. The authors used the data of all banks in the US from 1988 to 2008. For small banks, the results showed that tight monetary policy was resulting the reduction in liquidity creation. This effect was weaker throughout the financial meltdown. Moreover, the findings also indicated that liquidity creation was slightly greater before the financial meltdown, which suggested that liquidity creation measure have illustrative powers in forecasting the financial meltdown. Berger and Bouwman (2009) studied the impact of bank capital ratio on liquidity creation on all U.S. banks for the time span of 1993 to 2003. The authors created four liquidity creation measures and found that banks perform as liquidity creator when they transform their long-term assets into short-term liabilities. Banks do this by holding their long-term assets, (i.e., illiquid corporate investments) for their corporate clients and provide general public with short-term liabilities, (i.e., savings deposits). The findings showed significant and positive relationship between the bank capital and liquidity creation for large, negative for small banks, and insignificant for medium banks.

Diamond and Rajan (2001) examined the relationship between bank deposits and capital ratio. Capital providers cannot deposit amounts to such banks which bounds their desire to make available funds, and therefore decrease liquidity creation. So, the banks that have lower capital ratio and higher liquidity will produce vice versa, suggesting a negative link between bank capital and liquidity creation. Gorton and Winton (2000) explained as to how the lower or higher bank capital ratio can increase or decrease liquidity creation by crowding-out deposits. It was found that deposits were much better liquidity to control for depositors than the investments in bank equity and higher bank capital ratio transfer investor's investments from bank deposits to equity.

III. Hypotheses

After giving a brief introduction about the research question and overview of the past literature, this section provides hypotheses of the present research. Both the theories cited above, i.e., 'financial fragility crowding out hypothesis' and 'risk absorption hypothesis' are aimed to be tested empirically for Pakistani banking industry by examining whether the net effect of capital on liquidity creation is positive or negative

for different size of banks. It is expected that the 'financial fragility crowding out hypothesis' is comparatively strong for small banks. One of the reasons of this expectation is that small banks deal more with small businesses, where close monitoring is required as discussed by Diamond and Rajan (2001). For checking whether it is true for banks in Pakistan, the first hypothesis of the study is developed as follows:

H_1: The relationship between bank capital and liquidity creation for small Pakistani banks is supporting "Financial fragility crowding out" theory.

On the other side, the 'financial fragility crowding out' effect is likely to be weak for large banks because these banks have more access funding from local or global capital markets. The 'risk absorption' hypothesis is likely to be strong for large banks because these are greater regulatory enquiry and market discipline than the small banks and this capacity may affect their risk absorption capacity. As per this assumption, the second hypothesis of the study is stated as follows:

H_2: The relationship between bank capital and liquidity creation for large Pakistani banks is supporting "Risk absorption" theory.

For medium banks, it is expected that either effect may control for these banks or both effects may offset each other.

IV. Methodology and Data Sources of Variables

This study employs the dataset of banking industry of Pakistan, for the time span of 2004 to 2013. The data has been extracted from balance sheets issued by the state bank of Pakistan. The sample is comprised of 17 large banks, 13 medium sized and 5 small banks. To examine the 'financial fragility' and 'risk absorption' effect, the classification of banks is made on the basis of 'bank size'. The reason for doing so is that there are several studies which illustrate that bank size is important while studying the liquidity creation of banks. For example, Kashyap, et al. (2002) showed the empirical proof of relation between deposits and loan commitments which is different for small and large banks. Berger, et al. (2005) also found that small and large banks have relative advantage in carrying different types of credit data. Hence, they will spread different kinds of advances. All these studies explored that small and large banks created entirely different types of advances. Therefore, this segregation has been made to develop the link between these two desired variables in depth (in this study) by constructing liquidity creation measure specifically for the banks of Pakistan.

The model designed for the analysis of banking industry is given below:

$$LC_{i,t} = c + \beta_1 (BCR)_{I,t} + \Sigma \lambda_{i,t} + \varepsilon_{i,t}$$

where

$LC_{i,t}$ = Liquidity Creation.
$BCR_{i,t}$ = Bank Capital Ratio.
$\Sigma\lambda_{i,t}$ = Matrix of Control Variables which includes Bank Efficiency, Bank size, and Bank Risk.
$\varepsilon_{i,t}$ = White Noise Term.

The detailed construction of liquidity creation measure is given below in various steps. After deriving the required variable, Pooled OLS technique of estimation has been used but the post estimations of the model reported the presence of fixed effects in the model estimation using F-Test. Hence, this led to move on further improved technique of estimation, i.e., fixed or random effect models. However, the regression has been run for all sized banks to see the effect of their deposits on liquidity creation in Pakistan.

1. Calculation of Liquidity Creation Measure

In this section, the process of constructing liquidity measure is given and thereafter, the estimation of designed models is presented. The present study followed the methodology adopted by Berger and Bouwman (2009) for constructing liquidity creation measure. It is based on three steps, i.e., (1) classification of the activities of balance sheet as illiquid (semi-liquid or liquid), (2) assigning weights to classified items in step one, and (3) joining the items being classified in step one and weighted in second step to construct liquidity creation.

a) Step 1: Classification of Activities

At this stage, assets are categorized either as illiquid, semi-liquid or liquid. These classifications are centered on time, ease and cost for banks to dispose of liabilities to get money to meet demand of their customers. On the other hand, liabilities and equities being characterized as illiquid, semi-liquid or liquid based on time, ease, and cost for customers are required to get funds from the bank.

b) Step 2: AssigningWeights

In the second step, weights are assigned following methodology given by Berger and Bouwman (2009) to the categories being developed in the first steps. These are provided in Table 1 given below. The authors followed the theoretical framework of liquidity creation theory which states that when banks transform fixed assets to current liabilities which means that they are creating liquidity through balance sheet. Positive weights were assigned to liquid liabilities and illiquid assets. So, when banks use liquid

TABLE 1

Classification and Assignment of Weights to the Items of Balance Sheet

Illiquid Assets (Weight = 1/2)	Semi-liquid Assets (Weight = 0)	Liquid Assets (Weight = -1/2)
Advances Non-Performing	Lending to Financial Institutions	Cash
Gross Advances Fixed assets	Other assets	Balances with other Banks Investments
Liquid Liabilities	Semi-liquid Liabilities	Illiquid Liabilities and Capital
(Weight 1/2)	(Weight 0)	(Weight -1/2)
Deposits	Borrowing from Financial Institution	Equity
Bills Payables	Other/misc. Liabilities	

Source: Authors' calculation.

liabilities (banks deposits) to fund illiquid assets (commercial advances), liquidity was generated. Likewise, negative weights were assigned to long-term liabilities, liquid assets, and the capital. Therefore, when banks used illiquid liabilities and capital to fund liquid assets (T-bills), the liquidity was smashed. It is important to note that the purpose to assign negative weight to capital was to capture the direct impact of capital on liquidity creation. Zero weights were assigned to semi-liquid items, based on the theory that these items fall between liquid and illiquid items.

c) Step 3: Joining the Activities of Steps 1 and 2

In the last stage, developed categories of bank assets are being multiplied by their assigned weights. The calculation of liquidity creation is presented in the Table 2.

After discussing the criteria for calculating liquidity measures, Table 3 shows a brief analysis of the facts of which the Pakistani banks are comprised. The liquidity

TABLE 2

Joining Items Categorized in Step 1 and Allotted Weights in Step II

Liquidity Creation =	+1/2*illiquid assets	+0 * semiliquid assets	-1/2 * liquid assets
	+1/2 * liquid liabilities	+0 *semiliquid liabilities	-1/2 *illiquid liabilities

Note: *shows coefficient is significant at 10% level, respectively.
Source: Authors' calculation.

TABLE 3

Summary on Liquidity Creation in Pakistan

	Liquidity Creation in 2004			Liquidity Creation in 2013		
	LC Rs. Billion	LC/TA	LC/EQ	LC Rs. Billion	LC/TA	LC/EQ
All Banks	256	0.3310	3.9400	3990	0.3510	4.5590
Large Banks	184	0.3360	4.3030	2318	0.3620	5.0650
Medium Banks	69	0.4700	6.5490	1363	0.4170	4.9670
Small Banks	1.5400	0.1880	0.9670	308	0.2730	3.6450

Source: State Bank of Pakistan.

position, since 2004 to 2013 was compared and the figures shows a substantial increase with the passage of time. However, medium banks showed a different picture with dropped figures but small banks were becoming a great source in this regard.

2. Data Sources

This section describes the list of variables and their calculations. The dependent variable is liquidity creation, and the main independent variable is a bank capital ratio. Two measures are used to control the bank risk: the first is a credit risk and second is a calculated sum of risk weighted assets divided by TA. The later measure is also known as z-score which is computed as ROA plus bank capital ratio divided by SD of ROA. z-score shows the bank distance from default. Greater value of z-score means that the bank is more stable. This measure is essentially used to control the bank risk; because, the main purpose of bank is to keep the capital to absorb risk. Moreover, for measuring bank size Natural log of total assets has been used. Bank efficiency is measured by cost to income ratio. Additionally, two measures for banking governance are employed, i.e., deposits and net loans to total assets ratio. Brief description and sources of data are given in Table 4.

V. Estimation

The results and their interpretations are explained in this section. To analyze whether financial fragility effect or risk absorption effect dominates in variously structured banks, this study uses unbalanced panel data. The data is extracted from the balance sheets issued by the State Bank of Pakistan from 2004 to 2013. Table 5(a) shows the results of descriptive statistics for all banks comprising of means and standard deviations of selected variables which will be used to check the impact of bank capital on liquidity creation in Pakistan.

TABLE 4

Variable Description

Variables	Notation	Definition	Source
Dependent Variable	Liquidity Creation	Measure of liquidity creation divided by total assets.	State Bank of Pakistan
Independent Variables	Bank Capital Ratio	Total bank equity divided by Total Assets.	State Bank of Pakistan
(i) Bank Efficiency	Cost to Income ratio	It is derived as Interest expensed divided by interest earned	State Bank of Pakistan
(ii) Bank Size	Ln(TA)	It is obtained by taking Natural log of Total Assets.	State Bank of Pakistan
(iii) Bank Risk	Credit Risk	Sum of risk weighted assets divided by Total Assets.	State Bank of Pakistan
	Z-score	Sum of ROA plus bank capital ratio divided by SD of ROA.	State Bank of Pakistan
(iv) Banking Governance	DPS/TA	It is measured by deposits to total assets ratio.	State Bank of Pakistan
	NL/TA	It is measured by net loans to total assets ratio.	State Bank of Pakistan

Source: Authors' calculation.

The total of 288 observations is included in an overall analysis of banking sector. Means and standard deviations of variable show the spread of data. On an average, banks are involved more in dealing with deposits to total assets, cost to income ratios and the credit risks. These variables are related to banking governance and efficiency. However, much variations is observed in credit risk measured by z-score. This analysis helps in knowing the importance of various variables included in the analysis. In Table 5(b) the same has been performed individually for each sized bank.

The results of descriptive statistics [Table 5(b)] shows that, on an average medium and large banks create more liquidity with lower capital ratio as compared to small banks. Large banks have lower cost to income ratio on an average, as compared to small and medium banks. Credit risk, z-score, Ln(TA), DPS/TA and NL/TA have lower means for small and medium banks than the large banks; but the variable z-score which measures the bank risk, again shows high variations in data set confirming the results of Table 5(a). In Table 6, correlation matrix of all variables is presented.

Liquidity creation is negatively correlated with bank capital ratio, BE, z-score, and positively correlated with credit risk, bank size (LN (TA), DPS/TA and NL/TA. All values of correlation are below the threshold set for the existence of multi-colliniearity. This shows that these variables are not related to each other and exogenous in nature.

TABLE 5(a)

Descriptive Statistics

Variables	All Banks		
	N	Means	Std. Deviation
Liquidity Creation (LC/TA)	288	0.3524	0.2869
Bank Capital Ratio (BCR)	288	0.1488	0.1489
Cost to Income Ratio (BE)	288	0.6659	1.4420
Credit Risk	288	0.5351	0.1591
Z-Score	288	17.0300	13.1600
Ln (TA)	288	18.2600	1.5700
DPS/TA	288	0.6923	0.1913
NL/TA	288	0.4261	0.1415

Source: Authors' calculation.

TABLE 5(b)

Descriptive Statistics for Different Bank Sizes

Variables	Small Banks			Medium Banks			Large Banks		
	N	Means	Standard Deviation	N	Means	Standard Deviation	N	Means	Standard Deviation
Liquidity Creation (LC)	124	0.23	0.37	114	0.44	0.17	50	0.44	0.10
Bank Capital Ratio (BCR)	124	0.22	0.19	114	0.10	0.08	50	0.08	0.02
Cost to Income Ratio (BE)	124	0.81	2.19	114	0.63	0.16	50	0.40	0.13
Credit Risk	124	0.49	0.19	114	0.57	0.13	50	0.56	0.09
Z-Score	124	15.21	14.43	114	15.65	11.64	50	24.71	10.29
Ln (TA)	124	16.98	1.22	114	18.81	0.90	50	20.17	0.56
DPS/TA	124	0.60	0.25	114	0.75	0.10	50	0.79	0.03
NL/TA	124	0.36	0.16	114	0.47	0.11	50	0.49	0.09

Source: Authors' calculation.

TABLE 6

Correlation Matrix

Variables	LC/TA	BCR	BE	Credit Risk (BR)	Z-Score (BR)	Ln(TA)	DPS/TA	NL/TA
LC/TA	1							
BCR	-0.7858	1						
Cost to Income Ratio (BE)	-0.2496	0.2785	1					
Credit Risk (BR)	0.7537	-0.5077	-0.1550	1				
Z-Score (BR)	-0.4637	0.3913	0.0347	-0.3877	1			
Ln (TA)	0.5364	-0.6195	-0.1360	0.3617	-0.0019	1		
DPS/TA	0.7112	-0.7774	-0.2239	0.5605	-0.2871	0.6682	1	
NL/TA	0.7756	-0.5266	-0.1857	0.7915	-0.2024	0.4761	0.6261	1

Source: Authors' calculation.

1. Regression Analysis

Table 7 contains results of the pooled regression estimates for all classifications of banks, and on the whole as well. After the model estimation Wald Test was applied to test whether fixed effects exist in the model with null hypothesis and that all coefficients are equal to zero or not. The probability of the proposed test rejects the null hypothesis in all cases suggesting that pooled OLS is not the suitable technique to be applied here. Moreover, to see whether the model suffers from random effects, the Lagrange multiplier test was also applied with null hypothesis that individual-specific or time-specific error variance components are zero ($H_0 = \sigma_2 = 0$), and if this is not rejected, the pooled OLS will be preferred. On the other side Breusch-Pagan Lagrange multiplier (LM) test was applied after Pooled OLS to see whether there exists random effects in the model or not. If null hypothesis is rejected then the random effect model is preferred. Table 7 reports all estimates of regression and the post estimation tests.

The estimates of Table 7 shows that overall bank capital is affecting negatively to the liquidity creation in Pakistan; while discussing individually, the same is observed in case of small banks; but medium and large sized banks showed positive impact on liquidity creation. Efficiency measure of cost to income ratio for all banks, except the medium size banks shows negative but insignificant effect on liquidity creation. This does not show the actual relationship of this variable with liquidity creation analysis of this study. Overall, the impact of bank size is observed negative on liquidity creation in Pakistan. Bank risk measure of z-score shows negative effect on liquidity for overall banking industry in Pakistan. Banking governance indicators shows a positive role in management of the liquidity in all types of banks in Pakistan. However, post estimations

of the model by employing these two tests, i.e., Wald test and LM test, rejected the Pooled OLS model and this led towards the selection of more appropriate model. In such case, the literature suggests two types of models which care Fixed Effect and Random Effect Models. The choice between these models is made by using Hausman Test. In the present analysis the probability of test favor the fixed effect model. Nevertheless the results of random effect model are also provided in Appendix-B.

TABLE 7

Pooled OLS Regression Analysis

Pooled OLS				
Variables	LC/TA			
	All Banks	Small Banks	Medium Banks	Large Banks
Bank Capital Ratio (BCR)	-0.5092	-0.7391	0.0258	0.2755
	(-9.36)***	(-14.30)***	(0.16)	(0.62)
Cost/Income Ratio (BE)	-0.0051	-0.0001	0.0595	-0.0548
	(-1.53)	(-0.04)	(1.16)	(-0.80)
Credit Risk (BR)	0.8648	1.069	0.6756	1.031
	(17.06)***	(18.92)***	(7.92)***	(7.80)***
Z-Score (BR)	-0.0017	0.0013	-0.0036	-0.0019
	(-3.99)***	(2.34)***	(-4.75)***	(-2.80)***
Ln (TA)	-0.0046	-0.0289	0.0146	-0.0215
	(-1.04)	(-4.56)***	(1.20)	(-1.50)
DPS/TA	0.4231	0.4516	0.4483	0.2116
	(9.50)***	(10.79)***	(3.73)***	(0.94)
NL/TA	0.1418	0.4877	0.2414	0.1404
	(2.24)**	(0.73)	(2.16)**	(1.02)
C	-0.306	0.0533	-0.7077	0.242
	(-1.74)*	(0.54)	(-1.62)	(0.69)
Observations	288	124	114	50
R-Square	0.93	0.98	0.78	0.88
Wald Test	Prob. > Chi^2= 0.0000	Prob. > Chi^2= 0.0091	Prob. > Chi^2?= 0.0007	Prob. > Chi^2?= 0.0000
LM Test	Prob. > Chi^2?= 0.0012	Prob. > Chi^2?= 0.0089	Prob. > Chi^2?= 0.0009	Prob. > Chi^2?= 0.0006

Note: ***shows coefficient is significant at 1% level, **shows coefficient is significant at 5% level, and *shows coefficient is significant at 10% level, respectively.
Source: Authors' calculation.

Table 8 display the estimates of Fixed Effects Model, after testing suitability of the Model by applying Hausman test. The rule of thumb is followed and if probability of the test is less than 0.05 the fixed effects model is used. This rule also validates here and therefore the Fixed Effect Model has been chosen. The estimates of the variables confirm that bank capital and liquidity creation are negatively related at 1 per cent significance level for both the overall panels and the small banks confirming the financial fragility crowding out effect. The results for other two sized banks are positive in nature which is consistent with risk absorption effect; however, these results are insignificant in magnitude. Bank efficiency, bank risk and governance measures also show the same nature of relationship, mostly in all cases which were also observed in the pooled OLS analysis.

TABLE 8

Fixed Effect Regression Model

Fixed Effect Model				
Variables	LC/TA			
	All Banks	Small Banks	Medium Banks	Large Banks
Bank Capital Ratio	-0.5095	-0.7392	0.0252	0.2755
	(-9.52)***	(14.79)***	(0.16)	(0.67)
Cost/Income Ratio	-0.0051	-0.0001	0.0583	-0.548
	(-1.59)	(-0.04)	(1.19)	(-0.87)
Credit Risk	0.8653	1.069	0.6739	1.031
	(17.35)***	(19.56)***	(8.26)***	(8.51)***
Z-Score	-0.0017	-0.0289	-0.0036	-0.0019
	(-4.06)***	(2.42)**	(-4.95)***	(3.06)***
Ln (TA)	-0.0049	-0.0289	0.0134	-0.0215
	(-1.18)	(-4.71)***	(1.27)	(-1.64)
DPS/TA	0.4212	0.4515	0.4456	0.2116
	(9.76)***	(11.16)***	(3.89)***	(1.02)
NL/TA	0.1479	0.0487	0.2537	-0.1404
	(2.58)***	(0.79)	(2.70)***	(-1.11)
C	0.2666	0.0532	-0.6281	-0.2429
	(-3.60)***	(0.56)	(-2.50)***	(0.75)
Hausman test	0.0640	0.0323	0.0030	0.0001
Observations	288	124	114	50
R-Square	0.88	0.97	0.89	0.63

Note: ***shows coefficient is significant at 1% level, **shows coefficient is significant at 5% level, and *shows coefficient is significant at 10% level, respectively.
Source: Authors' calculation.

2. Post Estimations

After running the model Pooled OLS, the post estimation tests for detecting various econometric diseases like Hetreoskadasticity and autocorrelation are applied. By applying the IM test for heteroskedasticity and Wooldridge test for autocorrelation the p-values exhibits the presence of both problems in the model. The results are presented in Appendix-C. From these diagnostics, it is clear that estimates of fixed effect model are not reliable. In this scenario the literature suggests the option of Generalized Least Squares Model because it deals with those problems (by default) which the model of this study is suffering from. The following section covers the detailed explanation about this model.

3. Generalized Least Squares (GLS) Model

Generalized least squares (GLS) method is used to improve the efficiency of estimates. Technically speaking, if linear specification is defined as $y = X\beta + e$ then the GLS will be preferred over OLS when var(y) is not a scalar variance-covariance matrix or in other words, this method deals with inequality of variances. GLS estimators also have the property of BLUE estimates. This technique is considered a good choice if OLS model suffers from two econometric diseases, i.e., autocorrelation and heteroscadasticity. Table 9 display the results of this in a more refined model encountering the econometric diseases.

Again, the table shows the results of GLS Model and that there exists negative relationship between the bank capital and liquidity creation. It means that banks in Pakistan (with less capital) create more liquidity. After detection of the econometric issues the signs of other variables also remain the same as being observed in case of fixed effect model. However, the significance of estimates have been improved, due to better choice of the model. The impact of bank efficiency measure is observed negative in most cases but it is significant only for large scale banks. The relationship between the bank risk measures and liquidity creation is turned positive after correcting problems of heteroscadasticity and autocorrelation. Similarly, the bank governance measures have shown positive effect on liquidity which is the same, as observed in Tables 7 and 8.

Concluding these results, the negative relationship between liquidity creation and bank capital for all banks portrays that 'financial fragility effect' generally dominates the whole banking industry of Pakistan, specifically, at individual levels it is found only for small and medium sized banks. For large size banks, this relationship is observed positive with highest significance level, i.e., 1 per cent. It means that large banks have large capital and therefore they can create more liquidity due to 'risk absorption effect.' These banks have the ability to bear risk. Large capital allows banks to keep high-risk and long term assets, such as business loans with less risky fewer short term assets such as treasury bills. Hence, the results confirm the domination of 'risk absorption effect' for large banks.

TABLE 9

Generalized Least Squares (GLS) Model

GLS Model				
Variables	LC/TA			
	All Banks	Small Banks	Medium Banks	Large Banks
Bank Capital Ratio (BCR)	-0.5315	-0.6519	-0.2542	2.2080
	(-6.98)***	(-5.94)***	(-1.67)*	(3.17)***
Cost/Income Ratio (BE)	-0.0002	0.0004	-0.0407	-0.1694
	(-0.10)	(0.19)	(-0.96)	(-2.84)***
Credit Risk (BR)	0.8765	0.9496	0.8944	1.2020
	(22.38)***	(14.39)***	(14.78)***	(9.77)***
Z-Score (BR)	0.0006	0.0022	-0.0024	-0.0092
	(0.69)	(1.95)*	(-1.22)	(-4.51)***
Ln (TA)	-0.0228	-0.0316	-0.0105	0.0327
	(-3.88)***	(-3.95)***	(-0.75)	(2.37)**
DPS/TA	0.453	0.4483	0.8172	0.3499
	(11.18)***	(9.01)***	(6.95)***	(2.08)**
NL/TA	0.0804	0.0681	0.0595	-0.2774
	(1.73)*	(1.16)	(0.64)	(-2.30)**
C	0.1596	0.1198	-0.4585	-0.9290
	(0.69)	(1.05)	(-1.18)	(-2.76)***

Note: ***shows coefficient is significant at 1% level, **shows coefficient is significant at 5% level, and *shows coefficient is significant at 10% level, respectively.
Source: Authors' calculation.

VI. Conclusion

This research investigates the liquidity creation in banking industry of Pakistan and the impact of bank capital on liquidity creation. The contribution of this study is that it determined empirically (for the first time) the degree of liquidity creation in case of all sized banks of Pakistan and the nature of relationship between bank capital and liquidity creation. For measuring liquidity, the approach given by Berger and Bhouwman (2009) has been used on the data of banking industry of Pakistan from 2004 to 2013.

This study generally found an overall negative relationship between bank capital and liquidity creation in Pakistan. However, in case of individual analysis for small and medium sized banks, the relationship is negative, which supports the financial

fragility effect. Liquidity creation is positively related to credit risk and deposits to total assets ratio but negatively related to bank size in both types of these banks. The findings suggest that banks with lower capital ratio create more liquidity but they do not have ability to absorb risk. This effect is reduced for medium size banks due to risk absorption effect. For large sized banks, the relationship being observed is positive between bank capital and liquidity creation supporting the risk absorption effect which purports that higher bank capital may improve the capability of banks to create liquidity. Moreover, for these sized banks, it is also observed that liquidity creation has positive relationship with credit risk, bank size and deposits to total assets ratio but negative relationship with cost to income ratio, z-score and net loans to total assets ratio. This proves that large banks can create more liquidity because these have sufficient capital to absorb risk of bank failure. On basis of the empirics, the null hypotheses of the study are rejected confirming financial fragility crowding out hypothesis for small banks and risk absorption hypothesis for large banks of Pakistan with respect to bank liquidity and credit creation.

VII. Recommendation

Findings of the study report that the bank size matters and different sizes of banks generate different amount of liquidity that causes either financial fragility or risk absorption effects in the economy. The empirics of this study suggest that if regulatory authorities would set higher capital requirements for banks in the time periods of inflationary pressures then this will allow to create more liquidity only by large banks restricting this for small and medium sized banks. This study can be helpful for policy makers to anticipate the effect of announced monetary policies by central bank on performance of the macroeconomic indicators in the economy because this policy actually depicts about the degree of liquidity by banks due to the fixation of various banking instruments. If after effects of the policy tools are known then the right directions could be provided to the government, in time for preparing the policy draft.

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APPENDIX-A

List of Banks

Small Banks	Medium Banks	Large Banks
First Women Bank	The Bank of Khayber	National Bank
Sindh Bank	The Bank of Punjab	Allied Bank
Albaraka Bank	Askari Bank	Habib Bank
Bank Islami	Bank Al Habib	MCB Bank
Burj Bank	Faysal Bank	United Bank
Dubai Islamic Bank	Habib Metropolitan Bank	
KASB Bank	JS Bank	
My Bank	Meezan Bank	
Samba Bank	NIB Bank	
Silk Bank	Soneri Bank	
Barclays Bank	Standard Chartered Bank (Pakistan)	
CITI Bank	Summit Bank	
Deutsche Bank	Bank Alfalah	
HSBC Bank		
The Bank of Tokyo		
Industrial and Commercial Bank of China		
Oman International Bank		

Source: Authors' calculation.

APPENDIX-B

	Random Effects Model			
	All Banks	Small Banks	Medium Banks	Large Banks
Bank Capital Ratio (BCR)	-0.5313	-0.7295	-0.1603	0.2755
	(-8.76)*	(-11.02)*	(-1.28)	(0.62)
Cost/Income Ratio (BE)	-0.0007	0.001	-0.0095	-0.0548
	(-0.34)	0.00	(-0.23)	(-0.80)
Credit Risk (BR)	0.8865	1.032	0.8513	1.031
	(23.02)*	(17.87)*	(13.71)*	(7.80)*
Z-Score (BR)	0.0001	0.0021	-0.0037	-0.0019
	(0.23)	(2.91)*	(-3.04)*	(-2.80)*
Ln (TA)	-0.018	-0.0333	-0.0054	-0.0215
	(-3.36)*	(-4.80)*	(-0.43)	(-1.50)
DPS/TA	0.4496	0.4663	0.6909	0.2116
	(11.67)*	(10.64)*	(6.05)*	(0.94)
NL/TA	0.0838	0.0499	0.124	-0.1404
	(1.81)***	(0.84)	(1.35)	(-1.02)
C	-0.0174	0.1245	-0.4526	0.242
	(-0.11)	(1.19)	(-1.23)	(0.69)

Note: ***shows coefficient is significant at 1% level and *shows coefficient is significant at 10% level, respectively.
Source: Authors' calculation.

APPENDIX-C

Cameron and Trivedi's Decomposition of IM-test

Source	All Bank			Small Banks			Medium Banks			Large Banks		
	chi^2	df	p	chi^2	df	p	chi^2	df	p	chi^2	df	p
Heteroskedasticity	187.5	35	0.0000	69.15	35	0.0005	65.45	35	0.0014	44.24	35	0.1361
Autocorrelation (Prob. >F)		0.009			0.0087			0.0000			0.012	

Source: Authors' calculation.