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Liquidity Dynamics in Pakistani Banks: Firm-Specific and Macroeconomic Determinants

Arslan Iqbal
PhD Scholar,
Department of Commerce, University of Karachi,
arslan.iqbal88@gmail.com

Fahim Qazi
Professor & Rector,
Khadim Ali Shah Bukhari Institute of Technology, Karachi, Pakistan
dr.faheemqazi@kasbit.edu.pk

Muhammad Mubeen
Assistant Professor, IQRA University Business School,
IQRA University, Main Campus, Karachi, Pakistan
mubin@iqra.edu.pk

Khurram Ali
Senior Lecturer, IQRA University Business School,
IQRA Universit, Main Campus, Karachi, Pakistan
khurram.mubasher@iqra.edu.pk

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Abstract

This paper investigates the determinants of bank liquidity in Pakistan by using unbalanced panel data of 18 commercial banks listed on the Pakistan Stock Exchange from 2004 to 2024. To explore the determinants, we use Generalized Method of Moments (GMM) estimation for dynamic panel model which effectively controls for endogeneity, unobserved heterogeneity, and autocorrelation. Liquidity is measured by two proxies: the ratio of liquid assets to total assets (LIQ1) and the ratio of total loans to total deposits (LIQ2). The results indicate that liquidity is highly persistent and that current levels are greatly impacted by lagged values. Bank size and deposits significantly increase liquidity under LIQ1 but decrease it under LIQ2, presenting the multidimensional nature of liquidity. Capital adequacy significantly improves lending capacity (LIQ2) but has a no significant impact on liquidity buffers (LIQ1). GDP growth and interest rates significantly provide opposing effects across the two measures, reflecting the asymmetric influence of macroeconomic conditions. The findings highlight the necessity of liquidity measures and provide managers and regulators with useful guidance to improve financial stability.

Keywords: Commercial banks Liquidity, macroeconomic variables, firm-specific variables, panel data approach, Pakistan

INTRODUCTION

Banks are significant players of the financial globe. They serve as a bridge between two different sectors of the economy, the surplus sector, which has excess capital, and the deficit sector, which requires capital. Banks are eager to advance loans and receive deposits (Horváth et al., 2014; Jenkinson, 2008). With the advancement of the banking system, this role has now diversified and become more complex, exposing banks to a variety of risks including, but not limited to, business risk, credit risk, liquidity risk, market risk, operational risk, regulatory risk, reputational risk, and systemic risk. Liquidity is a yardstick to measure insolvency (Teoh & Kumar, 2023).

The financial crises of the past thirty years can largely be described as liquidity crises (Stange & Kaserer, 2009). According to Drehmann and Nikolaou (2013) liquidity crises posed severe threats to the stability of global financial markets and the banking sector during 2007 to 2009. Furthermore, López-Espinosa et al. (2012) emphasized that funding liquidity is the most crucial determinant of global systemic risk within the international banking sector. Liquidity risk is the possibility that a bank may face a situation where it does not have sufficient cash or easily sellable assets to meet its financial commitments (Abdullah & Khan, 2012). Brunnermeier et al. (2009) explain liquidity as the capacity to obtain funds when required, either by converting liquid asset into cash or by borrowing funds through open market operations. Effective liquidity risk management enables bank to meet obligations and reduces the risk of a liquidity crisis, which poses severe systemic threats to emerging economies (Sopan & Dutta, 2018).

Funding liquidity is an institution-specific concept and can be defined as the ability of an institution to meet its financial obligations on time. It is mainly a concern for financial officers and treasurers, particularly in financial institutions such as banks. It represents the risk that a company or bank might fail to pay its short term obligations when they become due. Liquidity risk originates from two key sources: the first source is systematic, arising from macroeconomic factors, while the second is idiosyncratic, originating from bank-specific factors.

Major determinants of liquidity from macroeconomic factors are GDP growth, interest rates, unemployment, inflation, pandemics, global financial crises, or wars. Internal determinants, on the other hand, may involve regulatory requirements or compliance, as well as the individual characteristics of banks such as capital, loan growth, bank size, profitability, or non-performing loans.

In Pakistan, research studies conducted have mainly included bank-specific factors as independent variables while excluding macroeconomic factors that also impact banks' liquidity, such as in Iqbal (2012), Ahmed et al. (2021), & Mehmood et al. (2025). Researchers mostly relied on ordinary least square models which is an ineffective method for obtaining robust results on panel data. Moreover, most studies in Pakistan have mostly employed one proxy i.e. cash to assets ratio to compute liquidity. Another drawback is that most of these studies have used data from less than six years like Akhtar et al. (2011), Iqbal (2012), and Malik & Rafique (2013). In contrast, international research on this topic has adopted a broader and more comprehensive approach. This highlights the need for more extensive research on Pakistan's banking sector by incorporating both bank-specific and macroeconomic factors, using multiple proxies for liquidity, and covering longer time periods.

To bridge the gaps in local research, Pakistan surely needs research that based on credible international studies. Alongside bank specific factors macroeconomic variables also be considered as independent variables. Instead of using OLS Approach, the System Generalized Methods of Moments (GMM) is employed to obtain more robust results. Liquidly can be measured by two proxies. Furthermore, it is necessary to use data spanning more than 20 years for comprehensive and reliable results.

The study is outlined as follows: Section 2 discusses the existing literature related to the topic. Section 3 describes the data sources and research methodology. Section 4 explains the empirical results and discusses the results. Finally, Section 5 provides the conclusion of the study along with recommendations and directions for future research.

LITERATURE REVIEW

A substantial body of literature exists on the determinants of liquidity factors. These determinants are generally categorized into bank specific and macroeconomic factors, both of which influence the liquidity of banks across the industry. The literature review below discusses various concepts and studies relevant to this topic.

Akhtar et al. (2011) explored liquidity risk by conducting a comparison between Islamic and conventional banks in Pakistan. Their results showed significant positive relationship between return on assets (ROA) and liquidity risk for Islamic banks, while capital adequacy ratio (CAR) is positively significant for conventional banks. Moreover, Iqbal (2012) also conducted a comparative analysis of conventional and Islamic banks in Pakistan. Liquidity is measured by the ratio of cash and cash equivalents to total assets. The independent variables included bank size, capital adequacy ratio, return on equity and non-performing loans (NPLs). The study covered the period from 2007 to 2010 for five Islamic and five conventional banks. The empirical findings indicated that bank size CAR, and ROA had a positive and significant relationship with liquidity risk for both Islamic and conventional banks, whereas NPLs had a negative and significant relationship with liquidity risk in both equations.

Similar study was also conducted by Anam et al. (2012) in Bangladesh to analyze the relationship between liquidity risk and selected independent determinants. The dependent variable of liquidity was measured by the ratio of cash and cash equivalents to total assets. The study covered data for the period of 2006 to 2010. Their findings revealed that the model provided a good fit for Islamic banks but was unsuccessful in explaining liquidity risk for conventional banks. Net working capital and ROE were negatively associated with liquidity risk, while size, CAR, and ROA showed positive relationships.

Similarly, Vodova (2011) analyzed the determinants of liquidity measures by four proxies during 2001 to 2009. The independent variables included bank size, capital adequacy, crisis dummy, GDP, inflation, non-performing loans, return on equity, and unemployment. The findings revealed that liquidity had a positive relationship with capital adequacy, interest rates, and non-performing loan ratios, while showing a negative relationship with financial crises and GDP. The effect of bank size was inconclusive, and variables such as unemployment, profitability, interest margins, and policy rates were found to be statistically insignificant.

Munteanu (2012), investigated Romanian banks, highlighted that asset quality, capital adequacy, and interbank funding negatively affect liquidity, whereas bank stability exerts a positive and significant influence during periods of financial crisis. These results suggest that stronger capitalization and greater stability enable banks to better withstand financial stress and maintain adequate liquidity.

Similar, work also conducted by Malik and Rafique (2013) analyzed twenty-six commercial banks of Pakistan during 2007 to 2011. Liquidity was measured using two proxies: the quick ratio and net advances to total assets. Their results of both proxies indicated that bank size, interest rates, and non-performing loans (NPLs) were significant and positively associated with liquidity. In contrast, financial crises were negatively associated with the quick ratio proxy, while under the second proxy financial crisis are also positively significant because in crisis people take more loans to stabilize their position.

Cucinelli (2013) also explored the determinants of liquidity factors in the Eurozone, employing the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSF) as proxy for dependent variable, in accordance with Basel III standards. They found statistically negative association between bank size and liquidity, propose that larger banks either heavily rely on central bank facilities or mismanage liquidity. Capitalization was positively effects the liquidity in the long term, while better asset quality contributed to higher short-term liquidity. It is observed that banks with heavy emphasis on lending activities were more sensitive to liquidity risk. Moreover, GDP growth rate made a significant positive effect on liquidity, indicating that banks tend to keep more liquid assets in economic expansion. The study also noted revealed that financial crises prompt banks to adopt a more cautious approach toward liquidity management, specifically in the short term.

Similarly, Moussa (2015) in a study of determinants of banks liquidity on banks in Tunisia, used two measures for liquidity (liquid asset to total asset; total loan to total deposits). He employed both static and dynamic GMM model in his study and found that inflation rate, capital adequacy, and GDP growth rate have significant impact on liquidity, while bank size and credit risk are insignificant. Another study of this kind was performed by Yaacob et al. (2016) in Malaysia, where liquidity was measured by Net Stable Funding Ratio (NSF) and Liquidity Coverage Ratio (LCR) as recommended by the Basel Committee. The bank-specific independent variables in their model were asset quality, bank specialization, capital adequacy ratio (CAR), profitability and size, while the macroeconomic variables were GDP and inflation. Their findings revealed that the GDP growth was significant and made positive impact on liquidity. Conversely, inflation and CAR were also statistically significant but exhibited an inverse relationship with liquidity.

Singh and Sharma (2016) examined variables affecting the liquidity in Indian banks, grouping the explanatory variables into macroeconomic and bank-specific categories. The dependent variable of liquidity was calculated by the ratio of quick assets to total assets. Using a fixed effects model on data from 2000 to 2013, their estimates indicated that deposits, capital adequacy ratio, inflation, and profitability had a positive impact on liquidity, while bank size and GDP showed a negative effect. Cost of funds and unemployment were found to be statistically insignificant. Zaghdoudi & Hakimi (2017) studied the determinants of liquidity risk using panel data of ten Tunisian banks over a broad period from 1980 to 2015. The determinants examined included firm level factors and macroeconomic variables. On the macroeconomic side, economic growth was found to have a positive and significant impact on Tunisian banks' liquidity. From bank specific factors, Bank size showed a significant but negative relationship with liquidity risk, while capitalization, credit risk, crises, and economic growth were all found to have significant positive effects. Inflation, however, had no statistically significant relationship with liquidity risk.

Ojha (2018) examined commercial banks in Nepal during 2010–2017 by employing a Pooled OLS model, with liquidity also measured through the quick ratio. The results revealed that CAR and GDP had a significant positive effect on liquidity, while interest rates, ROA, and ROE had a significant negative impact. Inflation was found to be statistically insignificant in determining liquidity. Mahmood et al. (2019) also studied the impact of firm-specific and macroeconomic variables on banks' liquidity in Pakistan using the Fully Modified OLS method over the period 2000 to 2017. Liquidity was measured through the ratio of current assets to total assets. Their findings revealed that GDP, bank size, total deposit ratio, and unemployment were significantly and positively associated with liquidity, while liquidity is negatively correlated with ROA and money supply.

In Ethiopia, Assfaw (2019) investigated determinants of bank`s liquidity during 2011 to 2017 using a Fixed Effects Model. They used Fixed Effect Model and found bank size, loan and deposits growth have a significant positive determinant of liquidity. Similarly, Yitayaw (2021) explored both macroeconomic and bank-specific factors affecting liquidity in Ethiopian commercial banks, employing panel data of fifteen banks ranging from 2009 to 2019. Liquidity, proxy was the ratio of loans and advances to total deposits. The results depict that bank deposits, liquidity lag value has significant positive impact on liquidity. Conversely, bank size, capital adequacy ratio, and GDP growth exhibited a significant negative impact on liquidity.

Alqudah (2020) studied panel data of 13 banks in Jordan, measuring liquidity as the ratio of liquid assets to total assets. Using a Random Effects Model. Their study revealed that CAR, deposits, and inflation had a positive impact on bank liquidity, while bank size, GDP, and NPLs exerted a significant negative effect. Similarly, Tasnova (2022) analyzed the determinants of commercial banks' liquidity in the context of bank-specific and macroeconomic variables on 29 commercial banks of Bangladesh. They employed a Random Effects Model on panel data. Liquidity was measured through the quick ratio. Their results revealed that bank size, CAR, GDP, interest rate spread, and NPLs positively affected liquidity, whereas the business cycle and interest rates had a negative impact.

Teoh & Kumar (2023) analyzed the determinants of liquidity in five Southeast Asian countries durng 2011 to 2020, with liquidity measured as the ratio of total loans to total deposits. Their panel regression results vary from country to country. In the Philippines, Malaysia, Thailand, and Vietnam, liquidity was mainly influenced by bank-specific factors, whereas in Indonesia, both bank-specific and macroeconomic factors significantly influencing bank`s liquidity.

Mehmood et al. (2025) investigated the determinants of liquidity in Pakistani banks with a focus on firm-specific factors. Using Pooled OLS regression on ten years of data from 10 banks, they found that the asset quality ratio, bank size, capital adequacy ratio, and return on equity were significantly and negatively associated with liquidity. In contrast, non-performing loans and return on assets showed a significant positive relationship with bank liquidity.

Hypothesis of the Study

The topic of bank liquidity has been the subject of a significant number of studies in the body of existing research, especially in context of how it is molded and influenced by both bank-specific and macroeconomic variables. The insights, outcomes, and arguments discussed in these prior publications may serve as a foundation and point of reference for formulation of hypothesis.

Bank Size:

Empirical studies provide two different perspectives on the relationship between bank size and liquidity. The first perspective suggests a negative association, commonly stated by the "too big to fail" hypothesis. According to this view, larger banks tend to assume higher risks due to the implicit assumption of central bank`s assistance as a lender of the last resort (Tasnova, 2022; Yitayaw, 2021; Mehmood et al., 2025). In contrast, the second perspective supports a positive relationship between bank size and liquidity, as explained by the conventional transformation view. Studies such as Iqbal (2012), Anam et al. (2012), and Al-Homaidi et al. (2019) argue that smaller banks, being more engaged in traditional banking activities, often face greater challenges in managing liquidity risk compared to their larger counterparts.

H1: Bank liquidity decreases as bank size increases.

Bank Deposits

These are the major and most reliable sources of funding; banks rely heavily on customer deposits to meet their liquidity requirements. When deposit inflows are insufficient, banks may be forced to liquidate fewer liquid assets, frequently on unfavorable terms, to meet short-term obligations (Vodova, 2011; Berger & Bouwman, 2009). Sudden cash withdrawals by depositors can generate significant liquidity challenges for banks (Arif & Anees, 2012). Therefore, banks are bound to keep sufficient cash; otherwise, they must rush to sell their illiquid assets.

H2: Bank liquidity is positively influenced by the bank deposits.

Bank Stability

Munteanu (2012) found a significant and positive impact of bank stability on bank liquidity during the crisis period. Bank stability (Z-Score) consists of accounting measures of profitability, leverage, and volatility. It measures the number of standard deviations by which a bank's return on assets has to fall. The higher the Z-Score, the greater the stability.

H3: There is a positive relationship between bank`s liquidity and Z-Score.

Capital Adequacy Ratio:

Capital adequacy ratio is the percentage of a bank's capital that ought to be kept in reserve to cover potential losses to comply with the regulatory framework (Singh & Sharma 2016). Increase in this ratio is the buffer against the business losses (Munteanu, 2012; Berger & Bouwman, 2017). Several studies found that the Capital adequacy ratio is statistically significant and positive in determining bank`s liquidity as endorsed by Vodova (2011), Iqbal (2012), Cucinelli (2013) and sing & Sharma (2016). It is also alien with financial fragility hypothesis of Diamond and Rajan (2001) state that banks hold high liquid assets in case of higher bank capital to meet their reputation. The capital requirements may impose significant costs on banks, as they occasionally utilize reserves to facilitate withdrawals (Aqel, 2022). Another viewpoint is that liquidity is supported by risk absorption hypothesis which states that due to higher capital can absorb more risk (Berger & Bouwman, 2017). The studies of Yaacob et al. (2016), Zaghdoudi & Hakimi (2017) and Mehmood et al. (2025) also confirmed the same point of view.

H4: There is a positive relationship between bank capital and bank liquidity.

GDP Growth Rate

It reflects the economic business cycle (Singh & Sharma, 2016). During growth and boom phase of economy GDP growth is found significant negative determinant of liquidity (Yitayaw 2021). According to these findings, during economic expansions the needs of financial services rise, which eventually create liquidity stress. Although during depression period banks have become more liquid as the need of financial services deteriorates.

H5: There is a positive association between GDP growth rate and bank liquidity.

Inflation

Inflation is the continual rise in the general level of prices caused by slump in the buying power of currency. The inflation rate reduces the currency value and enhances the vulnerability of banking institutions, consequently impacting the loans issued to clients. Significant negative effects on bank liquidity were also discovered by Mahmood et al. (2019). H6: There is a negative relationship between inflation and bank liquidity.

Interest Rate

Policy rate of central bank significantly affects the loan portfolio of the banks. Increase in policy rates makes the loan expensive and adversely affects its demand by the borrowers. Higher interest rates also decrease banks' lending activity and raise the danger of a liquidity shortfall since banks find it harder to balance loan distribution and deposit mobilizations (Ojha, 2018; Tasnova, 2022).

H7: Interest rates significantly reduce the liquidity of banks.

DATA & METHODOLOGY

Data

The study uses a quantitative methodology to determine the factors that affect the liquidity of Pakistan`s commercial banks. It uses secondary data from 18 banks listed on the Pakistan Stock Exchange pertaining to the period 2004 to 2024. The dataset comprises unbalanced panels, because certain banks did not report for the entire study period, thereby capturing both time-series and cross-sectional patterns simultaneously, ensuring reliability for empirical analysis. All financial and macroeconomic data were collected from Thomson Reuters and annual reports of bank ensuring reliability for empirical analysis.

Measurement of Variables

Table 01 Summaries of Dependent & Independent Variables

Variable	Symbol	Proxy	Source
		Dependent Variable	
Liquidity	LIQ1	Ratio of Liquid Assets to Total Assets	Vodova (2011). Sing & Sharma (2016), Tasnova (2022)
Liquidity	LIQ2	Ratio of total loans to total deposits	Vodova (2011) Yitayaw (2021), Teoh & Kumar (2023)
		Independent Variable	
Bank Size	SIZ	Log of the total assets	Tasnova (2022), Yitayaw (2021), Mehmood et al. (2025)
Bank Deposits	Dep	Ratio of Deposits to total assets	Arif & Anees (2012), Yitayaw (2021)
Bank Stability	STAB	Sum of ROA and ROE ratio divided by standard deviation of ROA.	Munteanu (2012), Aqeel (2022)
Capital Adequacy Ratio	CAR	(Tier1+ Tier2 Capital) / Risk Weighted Assets	Malik & Rafique (2013), Aqeel (2022)
Gross Domestic Product	GDPG	Real GDP Growth Rate	Mehmood et al. (2019), Yitayaw (2021)
Inflation	INF	Consumer Price Index	Vodova (2011), Teoh (2023)
Interest Rate	INT	Monetary Policy Interest Rate	Tasnova (2022)

Methodology

To examine the data, initially descriptive statistics are analyzed, including mean, maximum, minimum, standard deviations, and skewness in order to capture the overall trends in the dataset. Secondly, panel data regression analysis is applied to investigate the determinants of bank liquidity with respect to both macroeconomic & bank-specific factors.

The dynamic nature of the economic relationship presented in the study suggested that the current behavior of liquidity might be impacted by its historical values. So, the use of dynamic models is essential. Impact of lagged dependent variable causes conventional panel models, such as fixed effects and random effects, inappropriate because of absence of lagged variable, which leads to endogeneity and spurious results (Hasanovic & Latic, 2017; Baltagi, 2008).

For this purpose, Arellano & Bond (1991) suggested a different GMM model for dynamic panel data to address endogeneity. Their model uses lags of variables and eliminates unobserved, time in variant individual effects thritough difference transformation and the incorporation of additional instruments.

Subsequently, Arellano & Bover (1995) and Blundell & Bond (1999) introduced the GMM model, an enhanced version of Arellano & Bond estimator. This approach was developed to deal with the weak instrument problem, which arises when the underlying variable is extremely persistent i.e. its value varies very little over time, a major drawback of difference GMM model. Two equations are created under System GMM: one in levels and one is transformed to first difference. It combines the level equations with the first different equation where the instruments are derived from the first differences. According to Ullah et al. (2018), GMM efficiently corrects for autocorrelation, mitigates endogeneity, compensates for unobserved heterogeneity in panels, and minimizes biases caused on by omitted variables and measurement errors.

The econometric model employed in this research, based on the conceptual research framework of System GMM and previously applied by Hasanovic & Latic (2017) and Yitayaw (2021), is presented as follows:

$$\mathbf{LIQ_{it}} = \alpha + \boldsymbol{\beta_1}(\mathbf{SIZ})_{\mathbf{it}} + \boldsymbol{\beta_2}(\mathbf{DEP})_{\mathbf{it}} + \boldsymbol{\beta_3}(\mathbf{STAB})_{\mathbf{it}} + \boldsymbol{\beta_4}(\mathbf{CAR})_{\mathbf{it}} + \boldsymbol{\beta_5}(\mathbf{GDPG})_{\mathbf{it}} + \boldsymbol{\beta_6}(\mathbf{INF})_{\mathbf{it}} + \boldsymbol{\beta_7}(\mathbf{INT})_{\mathbf{it}} + \boldsymbol{\gamma_{it}} + \boldsymbol{\delta_{it}} + \boldsymbol{\varepsilon_{it}}$$

Here, liquidity is a dependent variable tested in two equations: LI Q1 as the ratio of liquid assets to total assets, and LIQ2 as the ratio of total loans to total deposits. The details of all independent variables are presented in the above table. β represents the coefficients of each independent variable and α represents the constant of the model. $\boldsymbol{\gamma_{it}}$ represents bank specific time-invariant effects, while $\boldsymbol{\delta_{it}}$ is a term that is independent from one bank to another and $\boldsymbol{\varepsilon_{it}}$ is an error term.

Results & Discussion

This section deals with the results and analysis.

Descriptive Statistics

Table 02 contains the descriptive statistics of the variables employed in the study. We have taken two measures of liquidity in this study. Our first liquidity measure (LIQ1) is the ratio between cash and cash equivalents to total assets. This ratio pertains to banks' sensitivity in relation to their liquid assets to total assets. The higher ratio signifies the stronger liquidity buffer and lower liquidity risk. This mean value reveals that Pakistani banks on average, have a 7% liquidity buffer relative to total assets.

The second liquidity proxy (LIQ2) is the ratio of total loans to total deposits. A higher value reflects more lending from deposits and, consequently, greater liquidity pressure. Its means value suggests that banks, on average lend 57% of their deposits, suggesting a moderate loan to deposit ratio. Due to the inclusion of both large and small banks in the sample, the high standard deviation indicates a significant variety in bank characteristics.

The average value of CAR is 23.2% which is well above the Basel regulatory requirements, revealing strong capitalization of Pakistani banks. The GDP growth rate over the 21year period average 3.75%, with values ranging from -0.4% (contraction period) to 7% (expansion period). Likewise, the average value of the policy rate and inflation rate 11% and 10% respectively, reflecting a persistence reliance on tight monetary policy in a high inflationary environment. For all variables kurtosis values are greater than 3 indicating leptokurtic distribution with fat tails indicating more extreme values in the data than in a normal distribution despite some mean-median values appearing close.

Table 02: Descriptive Statistics

	LIQ1	LIQ2	SIZ	DEP	BS	CAR	GDPG	INF	INT
Mean	0.071	0.575	5.589	0.739	12.884	0.232	0.0375	0.107	0.113
Median	0.068	0.560	5.646	0.754	12.347	0.150	0.042	0.095	0.110
Maximum	0.153	0.992	6.913	0.977	66.970	19.040	0.078	0.308	0.220
Minimum	0.033	0.009	3.605	0.322	-14.824	-0.9	-0.04	0.025	0.058
Std. Dev.	0.022	0.150	0.608	0.010	9.648	1.164	0.027	0.064	0.037
Skewness	0.974	0.073	-0.427	-1.085	1.258	14.209	-1.087	1.541	0.840
Kurtosis	3.951	3.426	3.020	4.645	7.043	213.135	4.360	5.481	4.172

Correlation Analysis

When employing the panel least square estimation method, an important assumption is the absence of perfect multicollinearity among the independent variables because it led to spurious estimates. Therefore, Table 03 presents the correlation coefficients among dependent variables i.e. bank liquidity and independent variables i.e. firm level and macroeconomic variables. The correlation between LIQ1 and LIQ2 is weak 0.07, indicating that they capture two distinct dimensions of liquidity.

LIQ1 shows a positive correlation of 0.32 with deposits ratio, suggesting that banks with higher deposit ratios maintain stronger liquidity buffers. Similarly, LIQ1 has a weak positive association with bank stability implying the stable banks tend to keep more liquid assets. In contrast, LIQ2 shows a moderate negative association with bank size, suggesting that larger banks tend to provide more loans, maybe due to their better access to financial markets for liquidity needs. Overall, there is no evidence of multicollinearity because the correlations among firm-specific characteristics are minimal.

On the macroeconomic side, however, some strong correlations are observed. Inflation and interest rates are highly positively correlated with value of 0.88, reflecting a real market phenomenon of tight monetary policy response where interest rate rises in response to inflationary pressure. This strong relationship raises multicollinearity concerns. The inflation variable is removed in future estimations to prevent inflated standard errors in the regression model. Similarly, GDP growth rate is also negatively correlated with both inflation (–0.66) and interest rated (–0.45) demonstrating the macroeconomic indicator`s countercyclical character.

In summary, from bank-specific factors, specifically deposits and bank stability appear more closely related to bank`s liquidity than macroeconomic variables.

Table 03: Correlation Matric

Variables	LIQ1	LIQ2	SIZ	DEP	BS	CAR	GDPG	INF	INT
LIQ1	1.00								
LIQ2	0.07	1.00							
SIZ	0.05	-0.36	1.00						
DEP	0.32	-0.19	0.05	1.00					
BS	0.17	0.02	0.04	-0.03	1.00				
CAR	-0.06	0.13	-0.08	-0.13	0.02	1.00			
GDPG	0.08	0.20	-0.23	0.09	-0.06	0.08	1.00		
INF	-0.08	-0.04	0.14	-0.14	0.04	-0.05	-0.66	1.00	
INT	-0.05	0.04	0.05	-0.16	0.03	-0.03	-0.45	0.88	1.00

The Two-Step System GMM Estimation Result for LIQ1

The dynamic panel GMM regression was estimated for bank liquidity (LIQ1) incorporating both firm-level and macroeconomic variables as determinants of liquidity across 18 banks presented in Table 04. The model meets important econometric diagnostics and explains a moderate amount of liquidity variation, as reflected by the 44% Adjusted R-Square. The Durbin-Watson statistical value is 2.14 suggests no serial correlation. The J-statistic value is 6.14 with p-value of 0.07 indicates that instruments are valid because the null hypothesis of over-identifying restrictions is not rejected. These facts strengthen the credibility of the GMM estimation.

Table 04: Regression Result LIQ1

Independent Variables	Coefficients	Standard Err.	t-value
C	-0.0144	0.0140	-1.034
Lag of LIQ1	0.5556**	0.0637	8.723
SIZ	0.0028*	0.0015	1.903
DEP	0.0467**	0.0107	4.359
BS	0.0001	0.0001	1.187
CAR	0.0005	0.0003	1.860
GDPG	-0.1038**	0.0263	-3.949
INT	-0.0507**	0.0181	-2.806
No. of observations	337	S.E. of regression	0.015
R-squared	0.4563	Durbin-Watson stat	2.1414
Adjusted R-squared	0.4441	Sum squared resid	0.0657
J-statistic	6.1463	Prob(J-statistic)	0.0660

** Significant at 0.01, * Significant at 0.05

The findings reveal that the lag coefficient of dependent variable LIQ1 is strongly significant at 1% level suggests that liquidity behaves as a robust factor across time, as the present value of liquidity is positively influenced by their previous values. These results are consistent with the theory that banks keep more liquid assets from one period to the next. This persistence also supports the use of dynamic panel models.

The model demonstrates that bank size significantly improves bank liquidity, indicating that 1% increase in bank size creates minimal but significant increase in bank`s liquidity. This coefficient suggests that, although the effect is not very strong, still larger banks often maintain liquidity buffers to maintain their reputation. These findings also rejecting the "too big to fail hypothesis" and similar with the findings of Iqbal et al. 2012) and Malik & Rafique (2013). However, they are contrary to Sing & Sharma (2016), Yitayaw (2021) and Mehmood et al. (2025).

Banks mostly rely on deposits to meet their liquidity needs. Deposits are also significant and positive in impacting bank liquidity with a coefficient of 0.05, which explains that a 1% change in the deposit's ratio may cause 0.05% increase in liquidity. It implies that higher deposit mobilization strengthens bank liquidity. These findings align with Sing & Sharma (2016), Yitayaw (2021). Opposite results are found by Asswaf (2011). However, the bank stability and capital adequacy ratio show a positive but insignificant relation with liquidity.

Among the macroeconomic factors, GDP growth rate is statistically significant and negative, indicating that a 1% change in GDP growth is associated with 0.10% decrease in bank liquidity. This indicates that during economic expansions, banks typically become optimistic and diminish their liquidity reserves, reallocating resources to lending opportunities as stated in financial fragility theory. These regression results are aligned with the studies of Vodova (2011), Moussa (2015), Singh & Sharma (2016), and Zaghdoudi & Hakimi (2017) but contrary to Yaacob et al. (2016) and Tasnova (2022).

The interest rate (policy rate) is also a significant and negative in determining bank`s liquidity suggesting that a 1% change in interest rate may cause 0.05% change in bank`s liquidity. This implies that as the opportunity cost of liquidity rises with higher interest rates, banks are discouraged from retaining liquid assets. The outcome aligned with the Vodova (2011) and Ojha (2018).

The Two-Step System GMM Estimation Result for LIQ2

The dynamic panel GMM regression was estimated for bank liquidity (LIQ2) measured by total loans to total deposits comprises both firm-level and macroeconomic variables as determinants of liquidity across 18 banks in Table 05. This model also meets important econometric diagnostics and explains a substantial explanatory power. The Durbin-Watson statistic 1.98 suggests no serial correlation. The J-statistic value is 1.1599 with p-value of 0.28 suggest that instruments are valid because the null hypothesis of over-identifying limitations is not rejected. This strengthens the credibility of the GMM estimation.

Table 05: Regression Result LIQ2

Independent Variables	Coefficients	Standard Err.	t-value
C	0.2003	0.0787	2.545
Lag of LIQ2	0.8021**	0.0291	27.562
SIZ	-0.0066	0.0110	-0.598
DEP	-0.1637**	0.0328	-4.986
BS	0.0000	0.0003	0.081
CAR	0.0039*	0.0018	2.165
GDPG	1.0939**	0.1545	7.082
INT	0.2181*	0.0896	2.435
No. of observations	337	S.E. of regression	0.081
R-squared	0.7390	Durbin-Watson stat	1.9855
Adjusted R-squared	0.7335	Sum squared resid	2.1609
J-statistic	1.1599	Prob(J-statistic)	0.2815

** Significant at 0.01, * Significant at 0.05

The lag coefficient of LIQ2 confirms strong persistence effect, with coefficient of 0.80 and highly significant at less than 1%. This suggests that historical liquidity significantly influences current levels and that judgments about liquidity are very path dependent.

The deposit ratio shows a significant negative effect on liquidity by 0.16, indicating a 1% increase in deposits ratio and may reduce liquidity by 16% at 1% level of significance. These results imply that majority of bank depositors belong from commercial and corporate side therefore unpredictable demands will force the bank to maintain high liquidity. These findings are consistent with the results of Shah et al. (2018), Asswaf (2019) and Teoh & Kumar (2023). The coefficient of Capital Adequacy Ratio of bank also positive and significant. The outcomes of Capital Adequacy Ratio infer that rise in CAR enhances bank`s ability to extend loans, with compliance of prudential regulation. These findings also support the financial fragility hypothesis, which suggests that the higher bank capital is associated with greater liquidity. Capital to avoid insolvency. Similar results are found by Vodova (2011), Singh & Sharma (2016).

According to macroeconomic variables, GDP growth rate exhibits a positive and highly significant effect on LIQ2 because improvement in GDP growth rate will increase bank`s lending relative to deposits. This contrasts with LIQ1 results, where GDP growth rate decreased liquidity demonstrating that LIQ1 and LIQ2 capture different aspects of liquidity. The results were consistent with the prior expectation of Zaghdoudi & Hakimi (2017), Aqel (2022). Interest rate displayed a positive coefficient of 0.21 and p value of less than 0.05, revealing a statistically positive impact on liquidity. It implies that higher policy rates encourage banks to expand lending to capture profitable interest margins. These results are also consistent with Vodova (2012).

CONCLUSION & SUGGESTIONS

This study investigates the dynamics of bank liquidity in Pakistan using panel data from 18 commercial banks during the period of 2004 to 2024, applying the system GMM estimator to handle indigeneity and dynamic effects.

Bank liquidity is a multidimensional phenomenon, as demonstrated by comparative evidence from both liquidity proxies: LIQ1 (liquid assets to total assets) and LIQ2 (loans to deposits). LIQ1 reflects Banks' buffers against liquidity shocks. Whereas LIQ2 captures the degree to which deposits are transformed into credit. The studies revealed that commercial banks' liquidity is positive and statistically significant in impacting the lagged value in both models confirming the persistence of liquidity behavior. While, interest rates, GDP growth, and deposits depict opposite effects based on the proxy, proving that depending solely on one proxy may provide an incomplete and misleading view of liquidity position.

From a regulatory standpoint, policy makers, authorities and bank`s internal management shouldn't rely exclusively on one ratio to evaluate liquidity. Both asset-side buffers i.e. liquid assets to total assets and funding-side sustainability, i.e. loan-to-deposit ratios should be considered when liquidity requirements are analyzed. The data also indicates that CAR is more important in easing lending pressure than in enhancing liquid asset buffers LIQ1 in relation to deposits LIQ2. Consequently, macro prudential regulators should target CAR to protect funding liquidity in an indirect way.

Furthermore, the fact that rising interest rates have a negative impact on LIQ1 and a favorable impact on LIQ2 indicates that monetary policy shocks are asymmetrical across liquidity dimensions, requiring tighter coordination between prudential regulators and central banks.

Finally, the study opens avenues for further research by adding more banks and extending the period of the study. There is space for incorporate more macroeconomic, bank-specific, and regulatory determinants that influence the banks' liquidity in Pakistan. Likewise, alternative proxies for liquidity might also be used to capture a broader scenario in future research.

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