Relation between liquidity creation, profitability, and regulatory capital for Islamic and conventional banks in GCC countries

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Abstract:

This study examines the interrelationship between liquidity creation, regulatory capital, and bank profitability in the Gulf Cooperation Council (GCC) banking sector. Using dynamic panel data and the 'generalized method of moments' (GMM) estimator for the period 2009–2023, we explore how these variables influence each other in a region characterised by oil-dependent economies and a dual banking system (comprising both Islamic and conventional banks).

Our findings reveal a negative bidirectional relationship between liquidity creation and regulatory capital, supporting the financial fragility hypothesis. However, this relationship varies significantly across bank types. We also find a positive association between liquidity creation and bank profitability, suggesting that banks generating more liquidity tend to perform better, which is contrary to the bankruptcy cost theory. In contrast, regulatory capital negatively affects bank profitability, although the magnitude and direction of this relationship depend on the capital definition used. By focusing on this unique regional and institutional setting while incorporating bank type heterogeneity, this study offers novel insights into the regulatory-performance-liquidity nexus and contributes to the literature on banking in emerging economies.

Key words: liquidity creation, Islamic banks, bank regulation, financial fragility, bank profitability

JEL classification: G21, G28

1. Introduction

Financial intermediation theory emphasises banks' roles in risk transformation and liquidity creation. Banks transform risk by funding risky loans with secure deposits (Diamond, 1984; Berger & Bouwman, 2016) and create liquidity by converting illiquid assets into liquid liabilities (Diamond & Dybvig, 1983). This function is vital for financial stability (Berger, 2017) but exposes banks to liquidity risk, prompting regulations like Basel III. This study examines how regulatory capital affects liquidity creation and profitability, focusing on Gulf Cooperation Council (GCC) banks.

The GCC's oil-dependent economies, reliance on bank financing, and unique regulatory environment—combining Basel III (Alaoui Mdaghri & Oubdi, 2022) and Sharia-compliant banking—make it an ideal setting. Unlike diversified economies, GCC banks face distinct liquidity and capital management challenges due to oil price volatility and limited capital markets.

Our research contributes to this area by addressing the GCC gap in existing literature, employing a dynamic panel GMM approach to mitigate endogeneity concerns, and comparing Islamic and conventional banks. We examine how regulatory capital changes affect liquidity creation and profitability; the relationship between capital, liquidity creation, and bank performance; and whether these dynamics differ by bank type. Using Berger and Bouwman's (2012) liquidity creation measure, we find that higher capital levels reduce liquidity creation—a result consistent across both Islamic and conventional banks. The paper proceeds as follows: Section 2 reviews literature, Section 3 details methodology, Section 4 describes data, Section 5 presents results, and Section 6 concludes with policy implications.

2. Literature review

2.1. Liquidity creation and regulatory capital

The relationship between liquidity creation and regulatory capital has been extensively studied, with two dominant theoretical perspectives emerging: the risk absorption hypothesis and the financial fragility hypothesis.

The risk absorption hypothesis posits that higher regulatory capital enhances the ability of banks to absorb risks, thereby encouraging greater liquidity creation (Berger & Bouwman, 2009; Bhattacharya & Thakor, 1993; Repullo, 2004; Wu et al., 2025). This hypothesis suggests a positive relationship between regulatory capital and liquidity creation, as well-capitalised banks are better equipped to manage liquidity risks and extend credit. Empirical studies, such as Berger and Bouwman (2009), find support for this hypothesis, particularly for large banks in the United States (US).

In contrast, the financial fragility hypothesis argues that higher regulatory capital reduces the ability of banks to create liquidity by making them less fragile and less incentivised to monitor borrowers (Diamond & Rajan, 2000; Gorton & Winton, 2000; Mantai et al., 2025). This hypothesis predicts a negative relationship between regulatory capital and liquidity creation. Empirical evidence from Distinguin et al. (2013) and Horváth et al. (2014) supports this view, particularly for small banks.

Additionally, the liquidity substitution hypothesis (Distinguin et al., 2013; Fu et al., 2015; Horváth et al., 2014) suggests that banks may substitute liquidity creation with other forms of funding, depending on their capital levels (Sahyouni et al., 2019). The liquidity risk hypothesis (Jokipii & Milne, 2011; Matz & Neu, 2007) further highlights the trade-off between liquidity creation and capital, emphasising that higher liquidity creation increases liquidity risk, which may necessitate higher capital buffers.

Based on these theoretical and empirical insights, we propose the following hypotheses:

- Hypothesis 1 (H1): Regulatory capital positively affects liquidity creation, consistent with the risk absorption hypothesis.
- Hypothesis 2 (H2): Regulatory capital negatively affects liquidity creation, consistent with the financial fragility hypothesis.

2.2. Liquidity creation and profitability

The relationship between liquidity creation and profitability is complex and multifaceted. On one hand, liquidity creation can enhance profitability by enabling banks to generate income through interest and fees on loans and deposits (Berger & Bouwman, 2009). On the other hand, excessive liquidity creation may increase liquidity risk and bankruptcy costs, thereby reducing profitability (Tran et al., 2016).

The expected bankruptcy cost hypothesis suggests that higher liquidity creation increases liquidity risk, which raises the likelihood of default and reduces bank profitability (Tran et al., 2016). This hypothesis predicts a negative relationship between liquidity creation and profitability. However, other studies argue that banks with higher liquidity creation may achieve greater profitability by leveraging their liquidity-generating capabilities to attract more customers and expand their operations (Berger & Sedunov, 2017).

Empirical evidence regarding this relationship remains mixed. For instance, Tran et al. (2016) demonstrate a negative association between liquidity creation and profitability, supporting the bankruptcy cost hypothesis. Conversely, Fungacova et al. (2017) find no significant relationship among Russian banks, except for those with higher household deposit shares.

Based on these findings, we propose the following hypotheses:

- Hypothesis 3 (H3): Liquidity creation positively affects bank profitability.
- Hypothesis 4 (H4): Liquidity creation negatively affects bank profitability, consistent with the expected bankruptcy cost hypothesis.

2.3. Regulatory capital and profitability

The relationship between regulatory capital and profitability represents another critical area of inquiry. Higher regulatory capital may enhance profitability by reducing funding costs and improving investor confidence (Berger & Bouwman, 2009). However, excessive capital requirements might constrain banks' abilities to generate returns, particularly for smaller banks with limited capital market access (Distinguin et al., 2013).

Empirical studies present mixed evidence. Berger and Bouwman (2009) demonstrate that higher capital levels correlate with greater profitability for large banks but not for

small banks. Similarly, Tran et al. (2016) report a positive relationship between regulatory capital and profitability, particularly among small banks. Conversely, Horváth et al. (2014) find no significant relationship for large Czech banks.

Based on these insights, we propose the following hypotheses:

- Hypothesis 5 (H5): Regulatory capital positively affects bank profitability.
- Hypothesis 6 (H6): Regulatory capital negatively affects bank profitability.

Table 1 show the most important studied on banks liquidity creation

Table 1: Empirical studies on interaction relates liquidity creation, regulatory capital and profitability

Empirical studies			
Authors	**Data and model**	**Objectives**	**Main results**
Berger and Bouwman (2017)	- Quarterly observation of U.S -commercial banks (1984-2008) - Panel Logit Regression	The connection relates liquidity creation with monetary policy, and financial crises.	- High level of liquidity creation can predict crises. - During normal times ,for small banks monetary policy maintain significant effects on liquidity creation unlike medium and large banks.
Berger and Bouwman (2016)	- Panel data for 278 German banks (1999-2009)	The impact of regulatory requirement on liquidity creation.	-Regulatory requirement reduce liquidity creation.
Fungáčová1 et al.(2017)	- Russian banks ; quarterly observations (1999-2009) - Panel data	The impact of deposit insurance on the link relates bank capital and liquidity creation	-Deposit insurance reduces the influence of capital on liquidity creation.
Tran and al.(2016)	-Yearly data of U.S banks (1996-2013) - Vector Auto-Regressive	The interaction between liquidity creation , regulatory capital, and bank profitability	- Small banks maintain positive relationship between regulatory capital and liquidity creation. - High level of bank liquidity is associated with lower profitability.
Distinguin et al.(2013)	- US and European commercial banks - Yearly (2000-2006) Panel data	The association relates bank regulatory capital and bank liquidity measured	- Banks when face illiquidity, they reduce their capital ratios - When they are exposed to illiquidity, small banks reinforce

	Simultaneous equations		their solvency requirement.
Fu et al. (2015)	Commercial banks in 14 Asia-Pacific economies Yearly 2005-2012 Simultaneous equations model with a generalized method of moments (GMMs) estimator Panel data	Investigate the bicausal interaction relates liquidity creation to regulatory capital.	- Large banks created the highest level of liquidity.
Horváth and al. (2014)	31Czech banks Monthly 2000-2010 Dynamic Pnael Granger-causality framework GMM	the link between capital and liquidity creation	-Liquidity creation Granger-causes a decrease in capital. - Small banks show that capital negatively Granger-causes liquidity creation.
Leo and al. (2013)	62 Dutch banks Monthly January 2004 to March 2010	Study the liquidity requirement of Dutch banks under Basel III regulation.	- Solvent banks hold liquid assets against their stock of liquid liabilities.
Esterhuysen et al. (2012)	Yearly 15,672 listed bank Stock Exchange (JSE) 2004 -2009	The effect of financial crisis on liquidity creation	-Financial crisis impact negatively liquidity creation
Andreou et al. (2016)	Yearly bank data 2004 -2009 Panel Data SFA	The impact of managerial ability on banks' liquidity creation and risk-taking behavior.	-Managers with higher ability take more risk which creates more liquidity.
Berger (2009)	Yearly Panel data for U.S. banks 1993-2003	The effect of bank capital on liquidity creation.	- Capital of large banks affect positively liquidity creation unlike small banks.
Pana et al. (2010)	Yearly Panel Data of 189 commercial bank 1997 -2004	The connection between merger activity and liquidity creation.	- The merger activity affects positively liquidity creation.

Hackethal, A and al. (2010)	Yearly Multivariate dynamic panel of 457 German savings banks for 1997-2006	The impact of macroeconomic factor and bank's characteristic on liquidity creation.	- Monetary policy indicators have a negative effect on liquidity creation.
Hou et al. (2017)	Yearly Panel Data of 61 Chinese commercial banks for 1996-2015	The interaction between bank diversification and liquidity creation.	-An increase in bank diversification of non-traditional bank activities rise bank liquidity creation.
Zheng et al. (2019)	Quarterly data of U.S banks (2003-2004).	The moderating role of bank capitalization on the interaction between bank failure and liquidity creation	Dependence between liquidity creation and bank failure depends of bank capital.
Berger et al. (2019)	Islamic and Conventional banks of 24 countries	Comparing the relation between liquidity creation and financial stability of Islamic and conventional banks	Conventional banks show negative relation between liquidity creation and risk.
Toh et al. (2019)	Malaysian commercial banks (2001-2017)	Effect of liquidity creation on bank capital; asset diversification and income diversification	Results are maintained when Malaysian Islamic banks were included
Chen et al. (2019)	Quarterly data of U.S commercial banks(2003-2014)	Relationship between bank failure and liquidity creation	Higher capital bank enhance to create liquidity but decrease failure risk.
Lei and al.(2016)	Yearly data for 113 domestic banks of china and 18 foreign banks for 1988-2009	Link between liquidity creation and bank capital.	-Liquidity creation and capital ratio are negatively associated.

Source: Authors' elaboration

3. Methodology

3.1. Econometric framework

To examine the interrelationships between liquidity creation, regulatory capital, and bank profitability, we employ a dynamic panel data model estimated using GMM. This methodology is particularly appropriate given the likely endogeneity among the key variables—for instance, while regulatory capital may influence liquidity creation, banks may simultaneously adjust capital buffers in response to liquidity risks, with profitability both affecting and being affected by these factors. The GMM estimator effectively addresses such endogeneity through internal instruments derived from lagged values of the endogenous regressors, ensuring consistent and unbiased estimates. The relationships under investigation are inherently dynamic, as past levels of liquidity creation and profitability likely influence current outcomes, which GMM accommodates by including lagged dependent variables as regressors to capture temporal persistence and feedback effects. The estimator also controls for unobserved heterogeneity across GCC banks—which operate in diverse regulatory and economic environments—by eliminating time-invariant bank-specific effects through first-differencing. Given our dataset's relatively small cross-sectional dimension (spanning 2009–2023), the system GMM approach proves to be particularly advantageous by mitigating small-sample bias and improving estimation efficiency through combined moment conditions from both differenced and level equations. This approach also addresses potential multicollinearity arising from lagged variables and interaction terms while ensuring robust estimates. Our estimation proceeds in two steps: initial first-differenced GMM estimation removes unobserved heterogeneity using lagged levels as instruments, followed by system GMM implementation that augments the model with level equations instrumented by lagged first differences to enhance efficiency and address potential weak instruments. This comprehensive methodology provides a rigorous framework for capturing the complex, dynamic, and endogenous relationships among our variables of interest.

To test the assumptions and answer the main question of this study, we estimate the following equations:

$$Liquidity\ creation_{i,t} = f\left(regulatory\ capital_{i,t}, profitabilty_{i,t}, Z_{i,t}\right) + \varepsilon_{i,t} \quad (1)$$

$$Regulatory\ capital_{i,t} = f\left(liquidity\ creation_{i,t}, profitabilty_{i,t}, Z_{i,t}\right) + \varepsilon_{i,t} \quad (2)$$

$$Profitabilty_{i,t} = f\left(liquidity\ creation_{i,t}, regulatory\ capital_{i,t}, Z_{i,t}\right) + \varepsilon_{i,t} \quad (3)$$

Where each variable is defined below:

Liquidity creation: we chose the liquidity creation indicator as introduced by Berger and Bouwman (2009). To calculate liquidity creation, we follow Berger and Bouwman's three-steps process for the two liquidity measures, the "Cat Fat" and the "Cat non Fat". The liquidity creation measure "Cat Fat" takes account of the activities on balance sheets and off-balance sheet, while the liquidity creation by "Cat non Fat" concentrates only on the balance-sheet activities. Berger and Bouwman (2009) conclude that the first measure ($Cat\ Fat$) is preferred to the second measure ($Cat\ non\ Fat$); since off-balance-sheet activities create effective liquidity like balance sheet account items.

Our analysis begins by classifying all balance sheet components—including assets, liabilities, equity, and off-balance sheet activities—into three liquidity categories: liquid, semi-liquid, and illiquid. As detailed in Table 2, this classification forms the basis for our liquidity creation measurement. While Berger and Bouwman (2009) propose classifying loans by either category or maturity (as liquid, semi-liquid, or illiquid), their research indicates that categorisation by loan type yields superior results. Consequently, we adopt this recommended approach, classifying loans based on their category rather than maturity characteristics.

Second, we assign specific weights to each liquidity category following Berger and Bouwman's (2009) methodology: a weight of -0.5 is applied to liquid assets (including liquid liabilities and liquid off-balance sheet activities), 0 for semi-liquid assets (comprising semi-liquid liabilities and semi-liquid off-balance sheet activities), and +0.5 for illiquid assets (encompassing illiquid liabilities and illiquid off-balance sheet

activities). Third, we calculate liquidity creation measures using both "Cat Fat" and "Cat non-Fat" approaches by combining the classified activities from step 1 with their respective weights from step 2, as detailed in Table 2.

In this study, we normalise both liquidity creation measures (Cat Fat and Cat non-Fat) by total assets to ensure comparability across banks and prevent larger banks from disproportionately influencing the results.

$$\boldsymbol{Cat\ Fat\ =}$$

$$\frac{\begin{array}{c}0.5\ x(\ illiquidi\ assets + illiquid\ liabilities +\ illiquide\ guarantees\ ) \\ +0x(semiliquid\ assets + semiliquid\ liabilities + semiliquid\ guarantees) \\ -0.5x(liquid\ assets + liquid\ liabilities + equities + liquidi\ guarantees + liquid\ derivatives)\end{array}}{Total\ assets}$$

$$\boldsymbol{Cat\ non\ Fat} = \frac{\begin{array}{c}0.5\ x(\ illiquidi\ assets + illiquid\ liabilities\ ) \\ +0x(semiliquid\ assets + semiliquid\ liabilities\ ) \\ -0.5x(liquid\ assets + liquid\ liabilities + equities)\end{array}}{Total\ assets}$$

Regulatory capital: For this study we retain three regulatory capital measures identified by the Basel Committee to measure the bank's capital. The first measure is Tier 1 capital ratio to risk-weighted assets ($CARA$). The second measure is total equity to total assets ratio ($CARB$). The third measure is total regulatory capital ratio($CARC$). The setting of minimum capital requirements has an important influence on bank liquidity creation. Thus, the subprime crisis consequences have strengthened the needs for regulatory capital. Consequently, it's important to know how higher capital requirement impact bank liquidity creation. Existing literature focusing on capital impact on liquidity creation (Berger, 2009; Horváth et al. 2014; Lei & Song, 2013; Fu et al. 2015) show that the relationship between these two variables could be either positive (the risk absorption hypothesis) or negative (the financial fragility crowd-out hypothesis).

Bank profitability: we choose two profitability measures. The first is the return on average equity ($ROAE$), the ratio of net income over the average total equity. It expresses financial profitability; it is the return from the shareholder point of view as

it highlights the return on their investments. The second is the return on average assets ($ROAA$), the ratio of net income to average total assets. It generally expresses the economic profitability.

Control variables: expressed in the vector $\boldsymbol{Z}_{i,t}$, which represents bank-specific and macroeconomic variables.

Table 2. Liquidity classification of bank activities for liquidity creation measure.

Illiquid assets (weight 1/2)	*Semiliquid assets (weight 0)*	*Liquid assets (weight-1/2)*
Assets		
Corporate & commercial loans	Residential mortgage loans	Total securities
Other loans	Other consumer/retail loans	Cash and due from banks
Intangibles assets	Loans and advances to banks	
Other assets		
Fixed assets		
Liquid liabilities (weight 1/2)	*Semiliquid liabilities(weight0)*	*Illiquid liabilities and equity (weight-1/2)*
Liabilities and equity		
Trading liabilities	Customer deposits-term	Subordinated debts
Customer deposits-current	Deposits from banks	Equity
	Other deposits and short-term Borrowings	Other liabilities
Illiquid guarantees(weight1/2)	*Semiliquid guarantees (weight 0)*	*Liquid guarantees/derivatives (weight-1/2)*
Off-balance sheet guarantees		
Acceptances and documentary credits reported off-balance sheet	Managed securitized assets reported off-balanced sheet	All derivatives
Committed credit lines	Other off-balance sheet exposure to securitizations Guarantees	

Source: Authors' elaboration

To ensure robust estimation of the relationships among regulatory capital, liquidity creation, and bank profitability, we incorporate a comprehensive set of control variables derived from established theoretical and empirical literature. These bank-specific variables are carefully selected to capture the key internal characteristics that influence both bank behaviour and financial performance.

First, risk**,** measured as risk-weighted assets to total assets (Berger, 2009), reflects the level of credit and market risk taken by banks. It is essential to control for risk exposure as it affects both capital adequacy and liquidity strategies. Second, size, proxied by the logarithm of total assets, is included because the relationship between liquidity creation, profitability, and capital regulation often varies by bank size—larger banks may have more diversified portfolios and easier access to capital markets. Third, productivity growth, calculated as the ratio of gross total revenue to personnel costs, serves as an indicator of operational efficiency. Based on Athanasoglou et al. (2008), banks with higher productivity are more profitable and potentially better positioned to meet regulatory requirements while maintaining liquidity. Fourth, expense management, measured as the ratio of operating costs to total assets, captures cost efficiency. Fiordelisi et al. (2011) argue that inefficient cost structures may erode profitability and limit a bank's capacity to hold sufficient capital.

At the macroeconomic level, we control for external economic conditions by including gross domestic product (GDP) in our analysis. As a standard measure of overall economic activity (Demirgüç-Kunt & Huizinga, 1999), real GDP growth affects multiple banking dimensions including credit demand, deposit mobilisation, and profitability. Positive economic growth typically enhances bank performance and facilitates liquidity creation, while economic contractions may simultaneously constrain both aspects of banking operations.

While other potential control variables such as inflation, interest rates, or financial market development indicators could have been included, we focus on a parsimonious

model to avoid over-specification and multicollinearity. These variables were excluded either due to data limitations across the GCC sample over the study period or because they showed high correlation with the included macroeconomic controls. The selected controls strike a balance between model precision and tractability while reflecting the core determinants identified in prior research.

4. Data

This study uses annual panel data covering 112 banks (73 conventional & 39 Islamic) operating across five GCC countries - Saudi Arabia, Qatar, the United Arab Emirates, Oman, and Bahrain - during the 2009-2023 period. The complete country-wise distribution of banks is presented in Table 3.

Table 3. Banks distribution by country

Countries	Islamic banks	Conventional banks	Total
Bahrain	10	12	22
KSA	5	14	19
Kuwait	2	13	15
Oman	9	14	23
Qatar	5	8	13
UAE	8	12	20
Total	39	73	112

Source: Authors' elaboration

Bank-level financial data were obtained from the Bankscope and Bloomberg database, while macroeconomic indicators (including real GDP growth rates) were sourced from the World Bank's World Development Indicators. Complete variable definitions along with their respective data sources are presented in Table 4.

Table 5 presents the descriptive statistics for all variables across the full sample, as well as separately for Islamic banks (IBs) and conventional banks (CBs). The results reveal several key patterns: first, liquidity creation measures show that CatFat averages approximately 15% for the full sample, while Cat non-Fat averages 1.3%. CB

demonstrate significantly higher liquidity creation levels compared to IB. Second, profitability metrics confirm that CBs maintain higher profitability than IBs, while risk indicators show the opposite pattern - IBs exhibit greater risk exposure than CBs. This finding aligns with expectations given that IB have a' more constrained operational scope due to Sharia compliance requirements. Finally, the data indicate that IB maintain notably higher regulatory capital ratios than their conventional counterparts, consistent with their risk profiles and business models.

Table 4. Variable definitions and data sources.

Variables	Acronym	Definition	Sources
Main variables			
Liquidity creation	LC1	"Cat Fat" liquidity creation per dollar divided by total asset.	Bankscope and author's calculation
	LC2	"Cat non Fat" liquidity creation per dollar divided by total asset.	Bankscope and author's calculation
Regulatory capital	CARA	Tier-1 capital ratio divided by total risk-weighted assets	Bankscope and author's calculation
	CARB	Equity to total assets	Bankscope and author's calculation
	CARC	Total regulatory capital ratio	Bankscope and author's calculation
Profitability	ROAE	Return on average equity	Bankscope and author's calculation
	ROAA	Return on average assets	Bankscope and author's calculation
Control variables			
Bank risk	RISK	risk-weighted assets divided by gross total assets	Bankscope
Bank size	SIZE	Logarithm of total assets	Bankscope and author's calculation
Productivity growth	PGROWTH	Rate of change in the ratio of gross total revenue over personnel	Bankscope and author's calculation
Operating management	OMA	The ratio of operating expenses over gross total assets	Bankscope and author's calculation
Real GDP growth	RGDP	Annual growth rate of real GDP	World bank and an author's calculation

Source: Authors' elaboration

Table 5. Summary statistics of key variables.

	All Banks		Conventional Banks		Islamic Banks	
	Mean	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**
CARA	0.229	648	0.212	491	0.284	157
CARB	0.216	648	0.194	491	0.285	157
CARC	0.250	648	0.236	491	0.293	157
LC1	0.325	648	0.364	491	0.203	157
LC2	0.199	648	0.217	491	0.141	157
ROAE	0.120	648	0.127	491	0.095	157
ROAA	0.019	648	0.019	491	0.019	157
OMA	0.010	648	0.008	491	0.015	157
PGROWTG	0.050	648	0.051	491	0.046	157
RISK	0.833	648	0.819	491	0.878	157
SIZE	8.393	648	8.471	491	8.149	157

Source: Stata output

5. Estimation results

We employ dynamic panel regression models using the GMM to analyse the data. This approach specifies the explanatory variables as lagged endogenous variables, creating an autoregressive model structure where variables are defined through recurrence equations determined by their initial values, with the lagged terms incorporating individual effects. The GMM methodology, originally developed by Holtz-Eakin, Newey and Rosen (1988) and subsequently refined by Arellano and Bond (1991) and Arellano and Bover (1995), provides several key advantages for panel data analysis. First, it effectively addresses simultaneous bias and reverse causality issues. Second, it controls for omitted variable bias through appropriate instrumentation. Third, it accounts for both individual-specific and time-specific effects while correcting for endogeneity biases, which is particularly important when using multiple lags of the dependent variable as regressors. Based on this framework, we estimate the following model equations.

5.1. *The interaction relates liquidity creation, regulatory capital, and bank profitability*

The GMM estimation results presented in Table 6a provide important insights into the relationships among liquidity creation, regulatory capital, and bank profitability in

GCC banks. First, we find a statistically significant negative impact of regulatory capital on liquidity creation across all model specifications, supporting the financial fragility hypothesis. This indicates that higher capital requirements constrain banks' liquidity creation capacity, potentially by reducing their risk-taking incentives. Within the GCC context—characterised by resource-dependent economies and significant exposure to oil price volatility—this finding suggests banks adopt a more conservative approach to liquidity creation during periods of economic uncertainty. While this result aligns with Horváth et al. (2014) for Czech banks, it contrasts with Berger and Bouwman's (2009) findings for large US banks, underscoring the significance of regional institutional contexts. Second, we observe a negative association between liquidity creation and regulatory capital, implying that banks engaging in greater liquidity creation tend to maintain smaller capital buffers. This pattern is consistent with the liquidity substitution hypothesis (Distinguin et al., 2013), as banks may substitute stable funding sources for capital when creating additional liquidity. Third, we find that liquidity creation has a positive and statistically significant effect on bank profitability, which contradicts the expected bankruptcy cost hypothesis. This result highlights the ability of GCC banks to effectively utilise liquidity creation to enhance profitability, especially in a financial system where bank financing plays a more dominant role than capital markets. Our analysis also reveals a positive relationship between regulatory capital and profitability, indicating that well-capitalised banks benefit from lower funding costs and greater investor confidence.

The control variables provide additional support for these findings. Bank size shows a negative association with liquidity creation, while productivity growth demonstrates positive effects, with both patterns aligning with Berger and Bouwman's (2009) findings. These results emphasise the distinct characteristics of the GCC banking sector and offer important insights for policymakers seeking to balance liquidity, capital adequacy, and profitability.

For future research, we recommend extending this analysis by incorporating more recent data and examining how macroeconomic shocks—particularly oil price fluctuations and the COVID-19 pandemic—influence these relationships.

Table 6a. Results of estimate of equations with LC1 as proxy of Liquidity creation.

	Liquidity creation			Regulatory capital			Profitability		
	LC1			CARA	CARB	CARC	ROAE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LC1 (-1)	0.481***	0.380***	0.485***						
	(0.000)	(0.000)	(0.000)						
CARA (-1)				0.357***					
				(0.000)					
CARB (-1)					0.340***				
					(0.000)				
CARC (-1)						0.447***			
						(0.000)			
ROAE (-1)							0.265***	0.257***	0.264***
							(0.000)	(0.000)	(0.000)
LC1				-0.156***	-0.160***	-0.121***	0.042***	0.128***	0.040***
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CARA	-0.160***						0.061***		
	(0.000)						(0.000)		
CARB		-0.924***						0.694***	
		(0.000)						(0.000)	
CARC			-0.162***						0.098***
			(0.000)						(0.000)
ROAE	-0.060***	0.004***	-0.055***	0.047***	0.064***	0.058***			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
OMA	-1.270***	-0.543***	-0.924	0.530***	0.581***	0.861***	-3.083***	-3.610***	-3.283***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PGROWTH	-0.043***	-0.033***	-0.044***	-0.011	0.003**	-0.004	0.213***	0.198***	0.214***
	(0.000)	(0.000)	(0.000)	(0.494)	(0.000)	(0.792)	(0.000)	(0.000)	(0.000)
RISK	-0.114***	-0.005	-0.114***	-0.362***	0.041***	-0.388***	-0.123***	-0.159***	-0.112***
	(0.000)	(0.118)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SIZE	-0.038***	-0.058***	-0.029***	-0.051***	-0.013***	-0.065***	-0.029***	-0.016***	-0.028***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RGDP	0.220***	0.153***	0.190***	-0.285***	-0.123***	-0.227***	0.291***	0.324***	0.304***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AB test AR(2)	0.059	0.047	0.054	0.947	0.209	0.768	0.774	0.880	0.829
Sargan test	0.774	0.649	0.813	0.932	0.656	0.843	0.629	0.646	0.581
Wald test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nbr of groupe	105	105	105	105	105	105	105	105	105
N	648	648	648	648	648	648	648	648	648

Source: Stata output

5.2. Robustness check

To enhance the robustness of our findings, we conduct several additional tests by:

-Replacing our primary liquidity creation measure (Cat Fat) with the alternative Cat non-Fat measure

-Substituting return on average equity (ROAE) with return on average assets (ROAA) as our profitability metric

-Re-estimating all equations separately for conventional and Islamic bank sub-samples.

To test whether our results in Table 6b varies among the new measures, we tried to estimate equations of liquidity creation using (LC2) instead of (LC1) and (ROAA) instead of (ROAE) for bank profitability. For shortness, we only tabulate the results on the lagged coefficients of our interest variable without reporting the control variables. Panel A of Table 4b shows that regulatory capital and liquidity creation affect each other negatively (columns 1a to 4b), and the positive effect of liquidity creation (LC2) on bank profitability (ROAA) reported earlier are robust. Similarly, the impact of regulatory capital is always positive and significant with profitability.

Panel B of Table 6c represents the estimation of the equations by replacing the measure of profitability of ROAE by ROAA. The estimate of the interaction using ROAA are largely corroborating with those using ROAE: verification of H2 and not verification of H1 and H3.

To verify whether the relationship between liquidity creation, regulatory capital and profitability are flexible to bank type, we have subdivided overall sample into two sub-samples: a sub-sample of CB and the other related to IB.

Panel A of Table 6e demonstrates the negative and significant impact of regulatory capital on liquidity creation, which is verified with both types of banks. Similarly, for profitability it affects negatively liquidity creation, which is reinforced by IB.

In addition, panel B of Table 4e presents that liquidity creation and regulatory capital are related negatively and significantly and this impact is robust with both types of banks. Hence, the most important remark from panel C in Table 4e is that, contrary to previous results, liquidity creation impacts negatively and significantly bank

profitability, which corroborates the expected bankruptcy cost hypothesis that suggests that a decrease in liquidity creation results is followed by higher liquidity risk, which can increase the default risk and consequently reduces bank performance.

Table 6a. Estimation results of equations with LC2 as proxy of Liquidity creation.

	Liquidity creation			Regulatory capital			Profitability		
	LC2			CARA	CARB	CARC	ROAE		
Panel A	**(1a)**	**(2a)**	**(3a)**	**(1b)**	**(2b)**	**(3b)**	**(1c)**	**(2c)**	**(3c)**
LC2 (-1)	0.591***	0.456***	0.613***						
	(0.000)	(0.000)	(0.000)						
CARA (-1)				0.357***					
				(0.000)					
CARB (-1)					0.335***				
					(0.000)				
CARC (-1)						0.454***			
						(0.000)			
ROAE (-1)							0.270***	0.256***	0.270***
							(0.000)	(0.000)	(0.000)
LC2				-0.203***	-0.242***	-0.158***	0.013***	0.151***	0.018***
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CARA	-0.124***						0.055***		
	(0.000)						(0.000)		
CARB		-0.756***						0.716***	
		(0.000)						(0.000)	
CARC			-0.099***						0.091***
			(0.000)						(0.000)
ROAE	-0.059***	-0.012***	-0.058***	0.038***	0.056***	0.053***			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
AB testAR(2)	0.006	0.001	0.004	0.877	0.238	0.781	0.801	0.804	0.858
Sargan test	0.732	0.703	0.708	0.896	0.685	0.824	0.588	0.635	0.602
Wald test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N of groupe	105	105	105	105	105	105	105	105	105
N	648	648	648	648	648	648	648	648	648

p-values are reported in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% respectively. AR(2) is The Arellano-Bond test for serial correlation with the null hypothesis of second-order autocorrelation in the first differenced residuals. Sragan test with of the null hypothesis for overidentification and correct specification of the model.

Source: Stata output

Table 6b. Estimation results of equations with alternative measure of profitability.

Panel B	Liquidity creation			Regulatory capital			Profitability		
	LC1			CARA	CARB	CARC	ROAA		
	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)	(1c)	(2c)	(3c)
LC2 (-1)	0.584***	0.450***	0.603***						
	(0.000)	(0.000)	(0.000)						
CARA (-1)				0.358***					
				(0.000)					
CARB (-1)					0.324***				
					(0.000)				
CARC (-1)						0.447***			
						(0.000)			
ROAA (-1)							0.259***	0.234***	0.241***
							(0.000)	(0.000)	(0.000)
LC2				-0.206***	-0.253***	-0.170***	0.029***	0.056***	0.032***
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CARA	-0.131***						-0.019***		
	(0.000)						(0.000)		
CARB		-0.772***						0.105***	
		(0.000)						(0.000)	
CARC			-0.116***						-0.007***
			(0.000)						(0.000)
ROAA	-.0049***	0.069***	-0.064***	0.012***	0.150***	0.050***			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
AB test AR(2)	0.005	0.001	0.003	0.930	0.288	0.756	0.133	0.102	0.108
Sargan test	0.758	0.682	0.698	0.905	0.649	0.864	0.667	0.549	0.642
Wald test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N of groupe	105	105	105	105	105	105	105	105	105
Observations	648	648	648	648	648	648	648	648	648

p-values are reported in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% respectively. AR(2) is The Arellano-Bond test for serial correlation with the null hypothesis of second-order autocorrelation in the first differenced residuals. Sragan test with of the null hypothesis for overidentification and correct specification of the model.

Source: Stata output

Table 6c. Estimations results for IBs and CBS with LC1 as measure of liquidity creation.

	Bank type					
	Conventional			**Islamic**		
Panel A : Liquidity creation						
LC1 (-1)	0.515***	0.471***	0.518***	0.301***	0.205***	0.313***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CARA	-0.426***			-0.107***		
	(0.000)			(0.017)		
CARB		-0.994***			-0.622***	
		(0.000)			(0.000)	
CARC			-0.357***			-0.145***
			(0.000)			(0.000)
ROAE	-0.057***	-0.020	-0.048***	-0.003	0.014	0.021
	(0.000)	(0.150)	(0.000)	(0.769)	(0.512)	(0.397)
AB test AR(2)	0.140	0.129	0.132	0.052	0.036	0.028
Sargan test	0.998	0.998	0.999	1.000	1.000	1.000
Wald test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N of groupe	70	70	70	36	36	36
N	491	491	491	157	157	157
Panel B : Regulatory capital						
CARA (-1)	0.431***			0.332***		
	(0.000)			(0.000)		
CARB (-1)		0.337***			0.476***	
		(0.000)			(0.000)	
CARC (-1)			0.538***			0.367***
			(0.000)			(0.000)
ROAE	0.073***	0.050***	0.072***	0.0581*	0.054***	0.033
	(0.000)	(0.000)	(0.000)	(0.052)	(0.000)	(0.476)

LC1	-0.114***	-0.135***	-0.093***	-0.063***	-0.295***	0.033
	(0.000)	(0.000)	(0.000)	(0.009)	(0.000)	(0.084)
AB test AR(2)	0.869	0.556	0.825	0.374	0.026	0.396
Sargan test	0.999	0.999	0.999	1.000	1.000	1.000
Wald test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N of groupe	70	70	70	36	36	36
N	491	491	491	157	157	157
Panel C : Profitability						
ROE (-1)	0.156***	0.153***	0.169***	0.540***	0.465***	0.495***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CARA	0.580***			-0.043**		
	(0.000)			(0.000)		
CARB		0.959***			0.221***	
		(0.000)			(0.000)	
CARC			0.627***			-0.023***
			(0.000)			(0.000)
LC1	0.132***	0.196***	0.132***	-0.196***	-0.027	-0.123***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.082)	(0.000)
AB test AR(2)	0.460	0.537	0.737	0.221	0.265	0.193
Sargan test	0.999	0.999	0.999	1.000	1.000	1.000
Wald test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N of groupe	70	70	70	36	36	36
N	491	491	491	157	157	157

p-values are reported in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% respectively. AR(2) is The Arellano-Bond test for serial correlation with the null hypothesis of second-order autocorrelation in the first differenced residuals. Sragan test with of the null hypothesis for overidentification and correct specification of the model.

Source: Stata output

6. Conclusion

This study investigates the interdependent relationships among liquidity creation, regulatory capital, and bank profitability within the GCC banking sector. Recognising the endogenous nature of these variables as established in prior literature, we employ a system of equations framework to analyse data from 112 GCC banks spanning the 2009–2023 period. This methodological approach allows us to properly account for the simultaneous determination of these key banking variables while capturing their dynamic interactions.

Our study expands the contemporary literature by fully evaluating the different effects of regulatory capital definitions, liquidity creation measures, and their connection to bank profitability. We show that the impact of regulatory capital on banks' ability to create liquidity is consistent across bank types, profitability measures, and different regulatory capital ratios.

These results support the financial fragility hypothesis, which suggests a significant and negative association between liquidity creation and regulatory capital for the entire sample. Specifically, an increase in capital is associated with a decrease in risk-taking and, therefore, a decrease in liquidity creation ability. This negative relationship holds regardless of bank type. We conducted various robustness tests, confirming that our results remain consistent.

The originality of this work lies in highlighting not only the effect of capital on banks' liquidity creation but also the impact of liquidity creation on bank profitability. However, two key inferences are necessary when implementing regulatory policies. First, the peculiarities of each bank type

— especially differences in size and sector of activity — must be taken into account. Second, there exists a trade-off between the benefits of financial stability induced by new capital requirements and banks' ability to respond to increasing financing needs as liquidity providers to the economy.

From a policy perspective, regulators should carefully consider the balance between ensuring sufficient capital buffers for financial stability and allowing banks enough flexibility to support economic growth through liquidity creation. Tailoring regulatory frameworks to different types of banks may enhance both stability and financial intermediation effectiveness in the GCC banking sector.

For future research, it would be valuable to extend the analysis to include post-2019 data, especially considering the impact of Basel III implementation and recent economic shocks. Additionally, investigating the role of other macroeconomic and institutional factors, such as political risk and deposit insurance, on the liquidity-capital-profitability nexus could further enrich understanding. Finally, comparative studies involving Islamic versus conventional banks, with deeper exploration of their operational and regulatory differences, may shed light on the heterogeneity in liquidity creation behaviour and performance outcomes

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