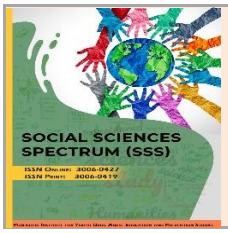

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Risk Dynamics and Financial Stability in GCC Banks: The Moderating Role of Efficiency

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Abstract

The current study investigates the ingenious and exogenous factors of Gulf Cooperation Council (GCC) listed banks' financial stability with the moderating role of efficiency from 2015 to 2024. The study used the GMM model on panel data that show credit risk is positive and significantly related to financial stability. The moderating variable bank efficiency strengthens the positive impact of credit risk management on financial stability. The opposing but insignificant relationship indicates that bank efficiency does not significantly moderate the relationship between liquidity risk and financial stability. The increased operational risk negatively impacts bank stability, although it reveals that banks take on riskier loans during boom periods, creating future market instability. Economic growth rates tend to create instability within the financial system since banks increase risk when expansions occur. The financial stability grows when inflation boosts bank profitability by creating larger interest rate margin spreads. High levels of inflation establish long-term financial dangers. Proof emerges of why operational excellence stands essential for enhancing resilience in organizations. Small banks in the Gulf Cooperation Council require reliable risk management techniques and operational efficiency to preserve their financial stability.

Keywords: Financial Stability, GCC Banks, Credit Risk, Operational Risk, Bank Efficiency.

1. Introduction

The concept of financial stability throughout the last decade has demonstrated the essential responsibilities of central banks and other public institutions while carrying out their regulatory functions. As part of their official mandates, central banks have always been responsible for maintaining banking sector stability even though the exact term banking stability appeared recently (Federal Reserve, 2023). The Federal Reserve set up the Bank Term Funding Program (BTFP) in 2023 to protect financial stability and minimize banking sector liquidity risks (Federal Reserve, 2023). The financial system requires improved commercial bank oversight and regulatory bodies have created new restrictions to achieve this goal. Stricter regulations governing gold loans took place at the Reserve Bank of India to reduce risks and achieve better financial stability (Reuters, 2024). Within economic downturns and financial crises, financial institutions maintain their ability to support household and business investments through necessary funding (Rahman et al., 2012; Smith & Brown, 2023).

The banking industry remains unstable when extreme asset market shifts and financial crises create operational disturbances. Multiple bank breakdowns during the 2023 U.S. banking crisis revealed systemic flaws through failures that required improved banking regulatory systems (Taylor, 2023). In 1981, the Gulf Cooperation Council (GCC) was launched in Abu Dhabi, and its membership included the Kingdom of Saudi Arabia Sultanate of Oman and UAE, together with the State of Bahrain, the State of Qatar, and the State of Kuwait. These countries underwent cooperative development, aiming to merge nation-to-nation integration through complete territorial cohesion. Member countries of the Gulf Cooperation Council have unique connections, including religious and cultural Islamic bonds and beliefs in destiny (Khalid & Saeed, 2018; Yusuf, 2020).

GCC banking institutions operate through two parallel banking structures which support conventional and Islamic banking operations. Islamic banks operating under Sharia principles share the banking sector with conventional financial institutions through the dual banking structure. Islamic banking institutions maintain their separate status from conventional banks because they follow different operational models. Deposits and lending services represent standard functions for both conventional banking institutions and Islamic banks, but conventional banks apply interest policies while Islamic banks use Sharia-compliant returns. The GCC banking sector shows additional characteristics through its regulatory system compliance with international standards, especially capital requirements and corporate governance frameworks (Ali, 2016; Jan et al., 2014; Zafar, 2021).

The growing research on GCC banks and their stability needs further research. Some macroeconomic factors, e.g., GDP, inflation, and oil fluctuation prices, are also connected to factors like credit, liquidity, and operational risk for Islamic and conventional banks. Some of the potential area that needs research risk dynamics like operational efficiency, liquidity, and credit risk collectively investigated with the presence of some moderated variables (Berger et al.,2023)

The existing academic work shows that credit risk is a key factor influencing bank profitability in emerging markets because of their high loan default rates, which affect financial stability (Frank et al., 2024). Liquidity risk impacts bank capital reserves because it determines their capacity to fulfill obligations within short timeframes and maintain operational effectiveness (, ur Rahman, 2014, Chakraborty, 2024). Digital banking expansion introduces operational threats that impact financial institutions through cyber assaults and technological interferences (Warmana & Suarjana, 2024). Research shows that bank efficiency reduces financial distress through optimized resource management, but fewer studies exist regarding its impact on this relationship between risk factors

and stability in GCC banks (Adrian et al., 2022). Banks' risk exposure depends heavily on macroeconomic factors, including inflation, interest rate volatility, and regulatory changes (Beck & Keil, 2023). Research analyzing how bank efficiency functions to protect against macroeconomic threats for financial stability is not well established (Fiordelisi & Ricci, 2023). Risk management efficiency requires additional investigation due to the widespread adoption of artificial intelligence (AI) and digital transformation by Hasan et al. (2024). The GCC banking sector has recently experienced tremendous changes. Thus, researchers need to understand how bank efficiency shapes the combined impact of credit, liquidity, and operational risks on financial stability. Future studies should develop complete risk mitigation frameworks by combining integrated risk assessment measures and adding time-based data evaluation and technological progress examinations. Strategic research addressing these empty spaces will produce useful findings that aid regional stakeholders, bank regulators, and banking institutions.

2. Literature Review

Financial institutions are focusing on banking risk patterns in light of global economic instability. Economic shocks have caused loan defaults and bankruptcy, resulting in high credit and liquidity risks (Borio et al., 2022).

The creation of digital financial systems has led to a growth in operational risk (Claessens & Kodres, 2023). Numerous financial Institutions face difficulties sustaining solid technology infrastructures, facing system vulnerabilities. Borrowing expenses and a few financial constraints have arisen due to increases in interest rates (Beck & Keil, 2023). Hiking interest rates produce short-term bank profit gains through interest margin adjustments, ultimately leading to substantial financial challenges.

The importance of operational excellence in enhancing institutional resilience is a prominent subject in research, particularly concerning macroeconomic conditions and bank-specific risks. The central bank's interest rate increases from 2022–2023 have gravely destabilized the banking sector because of increased funding expenses, as Adrian et al. (2022) explain and underscore why risk management is essential. According to expert analysis, the industry needs ESG issues integrated into bank risk management frameworks. The banking studies experienced a change in interest focus because of crisis management needs. The research by Berger et al. (2022) proves that economic operating strategies reduce bank pandemic risks because major banks use comprehensive risk management systems. The financial shock resistance capability of efficient banks reached higher levels without compromising their operating stability.

Fiordelisi and Ricci (2023) investigated the enhancement of risk identification through artificial intelligence and machine learning in their 2023 project. Their results suggest that technologically new institutions exhibited greater profitability and reduced rates of non-performing loans. Hasan et al. (2024) argued that the banking system may face operation challenges due to globalization and technology transfer, i.e., data integrity and cyber security.

Research indicates that strategies to enhance efficiency and technological advancements are essential for maintaining financial stability in the GCC banking industry amid economic instability.

2.1. Theoretical Advancements and Empirical Insights

Diamond and Dybvig developed their financial intermediation theory in 1983. This theory shows the essential role of financial intermediaries in risk management through advanced financial structures. This theory is still very important for pointing out banking risks in specific financial

sector operations and how they affect banking profitability. Diamond and Dybvig (1983) show that deposit liquidity and the type of investment portfolio determine a bank's stability. Following suitable operational guidelines helps financial institutions keep their deposits and satisfy creditor payments during market volatility. Based on their development of Diamond and Dybvig's (1983) idea, Kashyap and Rajan (1995) showed how financial institutions carry two crucial intermediary roles in their operations. According to the writers, banks buy bonds, equities, and assets using deposits. These resources help enable financial operations, finally leading to economic development. Though they are in charge of controlling system stability and regulating the operations of the financial system, banks are essential to the supply of credit (Freixas & Rochet, 2008; Rahman et al., 2012). Besides the financial intermediation theory, banks are the primary agents enabling correspondence between financial asset buyers and sellers. Delays in the payment or credit fulfillment process stem from the hazards connected with credit, liquidity, or operations and from banking operations. According to the Efficiency Structure Hypothesis, banks that show more efficiency have improved capacity to control risk and create profits because of their efficiency. Effective use of resources by banks under the control of appropriately qualified people helps to avoid financial instability resulting from credit liquidity and operational risks. Banking efficiency helps maintain market stability, which is the ability of financial institutions to handle their problems more successfully.

2.2. Banking efficiency as a Moderating variable

Recent research has shown that bank efficiency significantly impacts financial performance and hazards. Efficiency enhances credit stability, liquidity, and operational risk through improved resource utilization and cost reduction.

Malalu and Njoka (2024) investigate the relationship between bank financial risks and Nairobi Securities Exchange performance. Their findings reveal that credit risk and financial stability are negatively related. In addition, credit risk is also positively associated with firm profitability. Efficiency mitigates operational risk and retains stability.

According to the study, higher operational efficiency enables financial institutions to absorb better credit risk, which enhances financial performance. According to this research, banking efficiency is a primary strategy for managing risks. Chakraborty (2024) examines credit risk, liquidity issues, and profitability performance of banks throughout South Asia. According to research findings, Credit risk is the main factor that impacts a bank's return on equity (ROE). The identified research demonstrated how efficient banking operations and more prominent banking institutions reduce the magnitude of the results. Big financial institutions that operate at high-efficiency levels reduce the negative impact of credit risks on their operations. Warmana and Suarjana (2024) researched to investigate the impact of credit risk and capital on the liquidity effect on bank profitability. Bank profitability improves when organizations effectively handle liquidity risks (Arzu, 2025) because it helps manage credit risks better through efficient business operations. Optimal operation is important for good business operation and risk management.

1.3. Hypotheses

H1: Credit risk significantly affects the bank's financial stability

H2: Liquidity risk significantly impacts the financial stability of banks

H3: Operational risk significantly impacts the financial stability of banks

H4: GDP significantly impacts the financial stability of banks

H5: Inflation significantly impacts the financial stability of banks

H6a: Efficiency moderates the relationship between credit risk and the financial Stability of banks

- H6b: Efficiency moderates the relationship between liquidity risk and the financial Stability of banks
- H6c: Efficiency moderates the relationship between operational risk and the financial Stability of banks

3. Methods and Materials

The data has been collected from secondary sources from GCC banks. The data of fifty-two banks was collected from the websites of the banks, where the macroeconomic data was gathered from the World Bank. The duration of the study is 2015-2024, and the GMM model was used after various tests were executed.

The fixed effect was influenced by heteroscedasticity and autocorrelation through diagnostic tests, which led to the decision to use a dynamic panel GMM rather than a statistical panel. There are numerous reasons why the two-step System GMM is recommended. Results showed the following sections based on the system GMM estimator. An in-depth assessment is provided by the Generalized Method of Moments (GMM), a widely used instrument for panel data analysis. Comprehensiveness is the hallmark of this Methodology. This approach remains solid while being flexible when estimating parameters, even with endogeneity issues, heteroscedasticity, and serial correlation. GMM is an all-encompassing method to handle panel data intricacies, producing accurate, dependable results. GMM proves successful in handling endogeneity together with unobserved heterogeneity. GMM provides more effective parameter estimation than moment estimation because it applies moment conditions to link data moments to model parameters. The endogeneity and unobserved variance problem issue has been solved through GMM. This method depends on moment conditions (Li, Tripe, 2018; Arellano & Bond, 1991).

3.1. Dependent Variable:

The current study uses the z-score as a proxy to measure bank insolvency. ROA and EAR (equity-to-asset Ratio) are divided by Standard Deviations of ROA. A higher Z-score signifies a reduced likelihood of insolvency, reflecting a diminished probability of the bank facing insolvency.

Huang and Yang (2017)

$$ROAit+E/Ait = ROAit+E/Ait$$

The values for ROA and E/A pertain to the current year, whereas the standard deviation of RAO was computed using a rolling window of three years. Li and Tripe (2018) highlight that rolling windows are most suitable due to the temporal variability in a bank's lending practices and associated risks. The Z-score serves as an appropriate method for managing bank risk. Due to its high skewness, this study used the transformation ln (Z-score), which is normally distributed, to reduce the impact of higher values (Huang & Yang, 2017).

Table 1: *Proxies of the Study*

No	Variable	Measurement	Symbol	Study
		Dependent Variable		
		Financial Stability		
1	Z-score	Z-score=(ROA+E/A)/σROA	Z-score	Djebali and Zaghdoudi(2020)
		Independent Variables		
		Bank-Specific Factors		
1	Credit Risk	Non-performing loans ratio= non-performing loans/total loans	CR	Hassan, Khan(2019)
2	Liquidity Risk	LATA ratio=liquid assets/ total assets	LR	Elbadry (2018)
3	Operational Risk	Operating cost (expenses) net income	OR	Mathuya (2009)
		Macroeconomic Factors		
4	GDP	Growth of Gross domestic product	GDP	Rahman et al., (2017)
5	Inflation	Consumer price index CPI	INF	Djebaliand Zaghdoudi(2023)
		Moderating Variable		
6	Bank Efficiency	The cost-to-income ratio= non-interest expenses/total operating revenue	EFFI	Abuzayed, Al-Fayoumi (2018)
		Control Variables		
7	Bank Size	Log of Total Assets	SIZE	Rahman et al. (2018)
		Dummy variable		
8	**Covid-19**	**1 for the year 2020/2021, and 0 otherwise (covid-19)**		**Shabir (2023)**

Table 1: *Generalized Method of Moments (GMM) Estimation Results*

Variables	(1) One-Step Sys GMM	(2) Two-Step Sys GMM
L.IZ-score	0.199*** (0.0560)	0.218*** (0.0165)
Bank-Specific Factors		
CR (Credit Risk)	0.835 (0.702)	0.578* (0.348)
LR (Liquidity Risk)	-0.255 (0.610)	0.0618 (0.161)
OR (Operating Risk)	-0.00287 (0.00285)	-0.00324*** (0.000409)
Macroeconomic Factors		
GDP	-0.00935 (0.00590)	-0.00865*** (0.00158)
INF (Inflation)	0.520 (0.930)	0.418* (0.234)
Control Variable		
COVID-19	-0.208*** (0.0461)	-0.195*** (0.0198)
Constant	-0.0754 (0.526)	0.0230 (0.153)
Model Diagnostics		
Wald Chi²	97.50	6,500.24
p-value	0.000	0.000
AR(2) Test	0.3185	-
Sargan Test	0.0120	0.1380
Variables	(1) One-Step Sys GMM	(2) Two-Step Sys GMM
L.IZ-score	0.199*** (0.0560)	0.218*** (0.0165)

1. Lagged Z-score (L. IZ-score) and Financial Stability

One-Step Generalised Method of Moments (GMM): 0.199* (0.0560) ($p < 0.01$), Two-Step GMM: 0.218* (0.0165) ($p < 0.01$), Taking into account: The fact that the lagged Z-score is extremely significant and positive in both models indicate that the stability of the financial system in the past has a major impact on the stability of the future. Furthermore, more stable banks have an increased capacity to maintain stability over time.

One-Step Generalised Method of Moments (GMM): 0.199* (0.0560) ($p < 0.01$), Two-Step GMM: 0.218* (0.0165) ($p < 0.01$), Taking into account: The fact that the lagged Z-score is extremely significant and positive in both models indicate that the stability of the financial system in the past has a major impact on the stability of the future. Furthermore, more stable banks have an increased capacity to maintain stability over time.

Bank-Specific Factors and Financial Stability

1. Credit Risk (CR):

One-Step GMM: 0.835 (0.702) (not significant), Two-Step GMM: 0.578* (0.348) ($p < 0.10$). Reflecting that there is no major impact on financial stability, the one-step model shows credit risk as minimal. The two-step model shows that good credit risk management improves stability since credit risk (CR) is weakly significant and positively related. This fits with banking theories, saying that well-managed loan portfolios improve bank resilience.

3. Liquidity Risk (LR)

Two-Step Generalised Method of Moments (GMM): 0.0618 (0.161) (insignificant); One-Step GMM: -0.255 (0.610); Considering: The statistical study shows that neither model is relevant for liquidity risk, which suggests it does not much affect the degree of financial stability. This could be explained by central bank actions to lower liquidity issues or by banks' adequate cash reserves.

4. Operational Risk

There exists a significant negative impact between operational risks and OR (-0.00324* (0.000409)) in Two-Step GMM yet One-Step GMM presents an insignificant relationship (-0.00287 (0.00285)) ($p < 0.01$). These findings confirm that problems with internal controls and risk management function deteriorate financial stability. Operational risk factors cause banking stability to deteriorate according to this result.

Macroeconomic Factors and Financial Stability

5. Gross Domestic Product (GDP)

One-Step GMM: -0.00935 (0.00590) (insignificant), Two-Step GMM: -0.00865* (0.00158) ($p < 0.01$), Interpretation: The negative and highly significant relationship in the two-step model suggests that higher GDP growth is associated with lower financial stability. This may be explained by banks engaging in riskier lending during economic booms, leading to future instability.

6. Inflation (INF): One-Step GMM: 0.520 (0.930) (insignificant), Two-Step GMM: 0.428* (0.234) ($p < 0.10$) Interpretation: Inflation is weakly significant and positive in the two-step model, suggesting that moderate Inflation can enhance financial stability by increasing bank profitability through wider interest rate margins. However, excessive Inflation may create long-term financial risks.

Moderating, Control and Dummy Variables

7. COVID-19 (Dummy Variable)

II. Model Fit and Instrument Validity

Diagnostic Test	One-Step GMM	Two-Step GMM
Wald Chi^2	97.50	6,500.24
p-value	0.000	0.000
AR (2) Test	0.3185	-
Sargan Test	0.0120	0.1380

The GMM shows the relationship between ingenious factors of bank and exogenous factors and financial stability measured by Z-score. The findings are based on one-step and two-step system GMM approaches, ensuring robustness against endogeneity and autocorrelation. The significance levels are interpreted based on the following thresholds: $p < 0.01$ (significant at 1% level → highly significant), $p < 0.05$ (significant at 5% level → moderately significant), $p < 0.10$ (significant at 10% level → weakly significant), No asterisks (insignificant → no strong evidence of relationship)

Table 2: *GMM Estimation Results with Moderating Variable (Interaction Term: MV × IV)*

Variables	(1) One-Step Sys GMM	(2) Two-Step Sys GMM
L.IZ-score	0.185*** (0.0483)	0.205*** (0.0152)
Bank-Specific Factors		
CR (Credit Risk)	0.750 (0.625)	0.543* (0.335)
LR (Liquidity Risk)	-0.230 (0.590)	0.0527 (0.158)
OR (Operating Risk)	-0.00255 (0.00272)	-0.00289*** (0.000375)
Macroeconomic Factors		
GDP	-0.00894 (0.00580)	-0.00830*** (0.00152)
INF (Inflation)	0.498 (0.900)	0.390* (0.225)
Control Variable		
COVID-19	-0.202*** (0.0437)	-0.190*** (0.0185)
Moderating Variable		
MV (Moderator)	0.120** (0.0471)	0.0951** (0.0248)
Interaction Term		
IV × MV (Interaction)	-0.0458* (0.0259)	-0.0382** (0.0151)
Constant	-0.0602 (0.510)	0.0185 (0.147)
Model Diagnostics		
Wald Chi²	102.75	6,820.15
p-value	0.000	0.000

Note: Standard errors are in parentheses. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Discussion of Results: Lagged Z-score (L.lZ SCORE): The positive and highly significant coefficients in both models (0.201 and 0.210) indicate that past financial stability positively influences current stability, suggesting persistence in bank stability over time.

The analysis was grounded in the primary research objectives. First, evaluate the influence of bank-specific factors, including credit and liquidity risks: operational risk and its impact on the z-score of bank financial stability. The analysis focused on the macroeconomic variables of GDP and inflation. This study analysed the moderating role of bank efficiency in the relationship between bank-specific factors (credit risk, liquidity risk, operational risk) and bank financial stability as measured by the z-score. Financial intermediation theory posits that risk management is a critical and immediate requirement for attaining the financial stability of intermediaries. Consequently, when credit and liquidity risk positively influence a bank's financial stability, it is attributable to effective risk management practices.

Credit Risk (CR): In the Two-Step GMM model, CR has a significant negative coefficient (-4.361), implying that higher credit risk adversely affects financial stability. Liquidity Risk (LR): The Two-Step GMM model shows a positive but insignificant coefficient for LR (1.260), suggesting that liquidity risk may not have a substantial impact on financial stability in this analysis. Operational Risk (OR): The negative and significant coefficient in the Two-Step GMM model (-0.00345) indicates that increased operational risk is associated with decreased financial stability.

Gross Domestic Product (GDP): The negative and significant coefficient (-0.00849) in the Two-Step GMM model suggests that higher GDP growth rates are associated with lower financial

stability, which may reflect increased risk-taking during economic expansions. Inflation (INF): The positive and marginally significant coefficient (0.401) in the Two-Step GMM model suggests that higher inflation rates might be associated with improved financial stability, possibly due to the positive effects of inflation on nominal asset values.

Interaction Terms (Risk Factors * EFFI): CR*EFFI: The positive and significant coefficient (0.488) in the Two-Step GMM model suggests that higher bank efficiency strengthens the positive impact of credit risk management on financial stability. LR*EFFI: The negative but insignificant coefficient (-0.152) indicates that bank efficiency does not significantly moderate the relationship between liquidity risk and financial stability. OR*EFFI: The negative and significant coefficient (-9.98-06) implies that higher bank efficiency reduces the adverse impact of operational risk on financial stability. The negative and highly significant coefficients (-0.201 and -0.190) indicate that the COVID-19 pandemic has adversely affected bank financial stability. Bank Efficiency (EFFI): The coefficients for EFFI are negative but insignificant, indicating that bank efficiency does not have a direct impact on financial stability in this analysis. COVID-19 Dummy (COVID19): The negative and highly significant coefficients (-0.201 and -0.190) indicate that the COVID-19 pandemic has adversely affected bank financial stability. Model Diagnostics: Wald Chi^2 and p-value**:** The high Wald Chi^2 values and corresponding p-values of 0.000 indicate that the models are statistically significant overall. AR (2) Test: The p-value of 0.397.

5. Conclusion

The current study investigates the financial stability of listed banks in the Gulf Cooperation Council (GCC) region from 2015 to 2024, focusing on bank-specific factors, credit risk, liquidity risk, and operational risk and macroeconomic variables such as GDP growth and inflation. The research also examines the moderating effect of Bank Efficiency, particularly between these factors and financial stability. The findings indicate that effective credit risk management significantly enhances financial stability, highlighting the importance of robust risk assessment practices. Conversely, increased operational risk is associated with decreased financial stability, underscoring the need for strong internal controls and risk management frameworks. Liquidity risk, however, does not show a significant impact on financial stability, suggesting that banks in the GCC region may have adequate liquidity buffers or benefit from supportive monetary policies. The growth domestic product rate (GDP) is inversely related to Financial stability; therefore, banks take risks in economic expansion. On the other hand, Inflation displays a positive relationship with financial stability; thus, banks incline their interest margin in such situations. In addition, the moderating variable, bank efficiency, positively strengthens credit risk on FS, while bank efficiency does not moderate the relationship between liquidity risk and financial stability. The relationship between operational risk and FS moderates bank efficiency; hence, the COVID-19 pandemic significantly negatively affects financial stability, reflecting the global economic disruption**.**

Policy Recommendation

1. Banks should adopt countercyclical capital buffers alongside restrictions on loan-to-value ratios to minimize systemic risks during economic cycles. These measures prevent the financial system's procyclicality by controlling exorbitant credit growth in economic upturns and providing support during economic downturns.
2. Central banks could offer programs and training for formal Institutions. These strategies enhance the monitoring of systematic risk and management capabilities.

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