

## Does Financial Inclusion Mitigate Banking Risks? A Comparative Study of Nonperforming Loans and Liquidity in MENA Countries

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### ABSTRACT

Financial inclusion is a global overall policy objective. Still, its overall stabilizing effects on the banking sector are unclear, particularly in the developing and unstable conditions of the Middle East and North Africa (MENA) region. This study analyzes the central question of whether financial inclusion has diminishing or augmenting effects on two central banking risks: credit risk (proxied by nonperforming loans, NPLs) and liquidity risk. Employing a two-stage Generalized Method of Moments (GMM) estimator on a 2005-2022 panel data sample of MENA commercial banks, we construct a multidimensional financial inclusion index and examine its impact. We present evidence supporting a dual nature of financial inclusion. Greater financial inclusion is associated with a substantial decline in nonperforming bank loans, implying greater risk diversification and stability of the deposit base. In contrast, it's a liability-side issue with higher liquidity risk, which could occur owing to the conduct of small, transactional depositors. Estimates are found to be stable to alternative specifications and have a moderate "risk trade-off." According to our findings, although financial inclusion promotes asset quality, it requires advanced systems of liquidity management. Bank supervisors and policymakers should adopt holistic approaches to inclusiveness while simultaneously emphasizing the strengthening of liquidity protection measures to ensure overall financial stability.

**Keywords:** Financial Inclusion; Banking Stability; Non-Performing Loans (NPLs); Liquidity Risk; MENA Region; System GMM; Credit Risk; Financial Regulation

**JEL Classification:** G21; G28; O16; O55 C33

### INTRODUCTION

The financial sector provides the foundation of economic growth, serving a key financial intermediary function by transforming savings into productive investments, facilitating the smooth functioning of pay systems, and adding to the overall vibrancy of the economy (Beck and Levine, 2004; Rose and Hudgins, 2005). Therefore, stability in this sector is paramount to the health of the financial system at the regional and country level. However, in 2008, the global financial crisis and later the COVID-19 pandemic cruelly exposed the susceptibility of banks to systemic risk, primarily due to credit and liquidity risks. Credit risk (covered mainly by nonperforming loans) and liquidity risk (inability to pay short-term debts) are two darkly menacing factors that undermine the stability of the financial sector, and hence, economic growth (Imbierowicz and Rauch, 2014; Vodova, 2011).

The Middle East and North Africa (MENA) environment provides an interesting setting in which to study such risks. Regional economies, with two forms of banking (Islamic and conventional banks), have bank-based finance-based systems (Khediri et al., 2015). The region has been experiencing high nonperforming loan (NPL) ratios despite measures to develop the banking sector. Such high NPL ratios have been characterized as "financial pollution" sucking profitability out of banks, holding them back from disbursing credit, and jeopardizing financial stability (Ghosh, 2017; Alnabulsi et al., 2022). At the same time, liquidity risk has also been a concern and aggravated by the constraint of Sharia-compliance unique to Islamic banks, in which they lack traditional liquidity tools (Ariffen and Kassim, 2013).

Financial inclusion (FI) – access and usage of inexpensive formal financial services – has been on the high policy agenda in recent years to achieve sustainable development and financial resilience (World Bank, 2022). Despite the overall financial inclusion standing at 76% globally, it remains below 20% in the MENA region, demonstrating a substantial shortage in access to formal finance (Bahrain FinTech Bay, 2020). This lower percentage has very severe consequences, not only by depriving the economy of growth and creating burgeoning inequality, but also by seriously impairing the stability of the banking sector itself. In theory, the connection between financial inclusion and bank risk is two-sided. While, in the first place, financial inclusion increases the risk of credit by expanding credit to the unbanked masses, who may lack credit history (Ozili & Adamu, 2021). On the contrary, a more inclusive financial sector could result in bank stability by opening up the loan and deposit base, expanding on information asymmetry, and wielding stable sources of funding, thereby mitigating credit and liquidity risk (Hannig and Jansen, 2010; Danisman and Tarazi, 2020; Hakimi et al., 2024).

Despite this being a priority, the existing empirical studies on the risk-reducing role of financial inclusion, primarily in the MENA region, remain few and inconclusive. Whereas earlier studies have addressed nonperforming loan determinants (Boudriga et al., 2009; El Massah et al., 2019) and solo risk of liquidity (Boudriga et al., 2009), others addressed financial inclusion in relation to bank performance (Alnabulsi et al., 2022). There remains a much-needed research void. This lacuna is characterized by the paucity of studies that comprehensively investigate whether financial inclusion can serve as a strategic tool for mitigating both types of risks simultaneously, in the relative comparative instance of conventional and Islamic banks in the region.

Therefore, this study strives to close this gap by addressing the most critical research question: Does financial inclusion reduce banks' risks, such as nonperforming loans and liquidity risk, in the MENA region, and how do these differences exist between conventional and Islamic banks?

In the wake of this master question comes the study's overall hypothesis, namely: "Financial inclusion has a significant mitigatory role in reining in the extent of both nonperforming loans and liquidity risk for banks in the MENA region, with substantial differences in the strength and direction of this role between conventional and Islamic banks."

To respond to this question and confirm this hypothesis, the study will try to achieve the following objectives:

- Analyze the influence of financial inclusion on the number of nonperforming loans in MENA banks.
- **Hypothesis 1 (H1):** There is a statistically significant negative relationship between the degree of financial inclusion and the number of nonperforming loans for banks in the MENA region.
- Examine the relationship between financial inclusion and liquidity risk in the regional banking sector.
- **Hypothesis 2 (H2):** A statistically significant negative relationship exists between the level of financial inclusion and the level of liquidity risk in MENA region banks.
- Contrast the FI-risk relationship between conventional and Islamic banks.
- **Hypothesis 3 (H3):** Regional conventional and Islamic banks possess considerably dissimilar strength and/or direction of the relationship between banking risks (credit and liquidity) and financial inclusion.
- Examine the moderating role of corporate governance mechanisms between FI and banking risks.
- **Hypothesis 4 (H4):** The quality of Financial inclusion mechanisms (e.g., board size and independence) strengthens the mitigating effect of financial inclusion on banking risks.

It is expected that the findings of this research, which include tests of these hypotheses, will benefit not only policymakers and bank managers of the researched region but also contribute to more effective strategies focused on enhancing financial solidity while simultaneously attaining inclusive growth objectives.

The structure of this study is as follows: Section 2 is allocated to an in-depth literature review. Section 3 presents the research method, data sources, and the empirical model for hypothesis testing. Section 4 presents and interprets the empirical results in terms of testable hypotheses. Section 5 concludes with the most significant findings, considers policy significance, and provides suggestions for future research.

## Literature Review

Stability of the banking system is of tremendous significance to economic growth, and credit risk (long measured by way of Nonperforming Loans - NPLs) and liquidity risk are two areas of concern for both regulators

and bankers. The 2008 global financial crisis, followed by the COVID-19 pandemic, made it clear how sensitive banks are to these risks, prompting scholars to turn their attention to the determinants of these risks once again. More and more literature analyzes these risks in relation to bank-specific characteristics, macroeconomic conditions, and institutions. Financial inclusion (FI) has recently appeared as a potential strategic tool that could influence banking stability. This review synthesizes recent empirical research, with special reference to the MENA region, to offer the theoretical and empirical link between financial inclusion, NPLs, and liquidity risk and unveil the comparative relationship between conventional and Islamic banks.

### **The Dual Impact of Financial Inclusion on Banking Risks**

Financial inclusion, i.e., access to and usage of formal financial services, has a twofold connection with banking risks. FI has the potential to worsen credit risk, as Ozili and Adamu (2021) confirm that a sudden increase in formal account holding could lead to the inclusion of borrowers with poor credit records or collaterals, thereby increasing risk in loan portfolios.

To the contrary, extensive research upholds that FI supports bank stability. By widening the deposit base, FI complements the funding base of a bank with a more diversified and stable pool, which reduces liquidity risk (Hannig and Jansen, 2010). In addition, FI diversifies loan portfolios across a broader base of clients, which might insulate credit risk through greater risk distribution (Danisman and Tarazi, 2020). Empirical studies in the case of the MENA confirm this stabilizing function. Hakimi et al. (2024) found that financial inclusion in terms of access and usage-based indicators significantly reduces the size of NPLs. In a similar vein, Alnabulsi et al. (2022) demonstrated that FI shows a positive correlation with bank performance (ROE and ROA) in the MENA region and is associated with healthier loan books. Enhanced informational asymmetry and more effective resource allocation with inclusive finance underlie this positive correlation (Allen et al., 2014).

### **NPLs and Liquidity Causes of Banking Risks**

To put into context the provision of a role to FI, you have to understand the conventional bank risk determinants.

#### ***Credit Risk***

They arise due to the combination of micro and macro factors. Bank-level catalysts such as profitability (ROA), capital, and liquidity always take center stage in this respect. Higher profitability and bank capital cushions register lower NPLs due to the former's indication of loss absorption ability and connotation of prudent managerial decisions (Berger and DeYoung, 1997; Louzis et al., 2012). Conversely, the net interest margin (NIM) and credit growth sometimes indicate risk-taking credit and elevated NPLs (Espinoza and Prasad, 2010).

Macroconditions matter equally. Growth in GDP has a very negative correlation with NPLs since it enhances the borrower's ability to repay (Kjosevski et al., 2016). Inflation, unemployment, and high rates decrease real income and servicing debts, thereby propelling borrowers into default more (Szarowska, 2018). External shocks, such as economic policy uncertainty and country risk (political, economic, and financial), have been shown to significantly increase NPLs, with political risk emerging as a powerful driver (Aledemat et al., 2025; Saliba et al., 2023).

#### ***Liquidity Risk***

Liquidity risk, or a lack of funds to fulfill short-term commitments, is among the fundamental challenges of banks. Research in the MENA countries, such as that by El Massah et al. (2019), identifies determinants like bank size, capital adequacy, and credit risk as influencing traditional and Islamic banks equally, although with different operational principles. Of significance, also, is the observation that increased credit risk tends to make banks adopt conservative approaches to liquidity. The literature also attests that FI can positively influence liquidity by building a more stable and diversified base of deposits even as it reduces banks' dependency on volatile wholesale funding (Hannig and Jansen, 2010; Morgan and Pontines, 2014).

### **Role of Governance and Type of Bank in Moderation**

Corporate Governance: Board characteristics make a difference. Hakimi et al. (2024) illustrated how board characteristics like board size, CEO dualism, and independent director percentage have a material influence on NPL ratios. More precisely, their research affirmed that good governance structures complement the positive influence of FI in minimizing NPLs. In conclusion, it can be affirmed that well-governed financial institutions are more likely to contain the riskiness inherent in expanding their customer base to previously excluded market segments. Traditional vs. Islamic Banks:

Dual banking in the MENA region offers a fertile ground for conducting comparative studies. Islamic banks that do business based on principles of Sharia are typically more liquid (Khediri et al., 2015). However, when risk determinants are in question, studies like El Massah et al. (2019) suggest that bank type may not act as a

determinant, as both face the same determinants, including capital adequacy and GDP growth. But their response to external shocks, such as uncertainty, may be disparate. For instance, Aledeimat et al. (2025) found that global uncertainties (e.g., pandemics or trade policy) affect the NPLs/NPFs of conventional and Islamic banks in contrary directions, which implies that their distinctive financing models lead to distinctive risk profiles.

### Synthesis and Identification of the Research Gap

Literature provides a good foundation to describe banking risks in a solo. However, there is an actual gap. While FI-NPLs and FI-Liquidity have been analyzed individually in terms of their relationships, few studies integrate these two risks into a single analytical model, particularly from the perspective of the MENA region. Furthermore, while the moderating effect of corporate governance on the FI-risk relationship has long been established in the context of NPLs, the same applies to liquidity risk. Finally, there is no in-depth comparative analysis that simultaneously considers the differential impact of FI on NPLs as well as liquidity in conventional and Islamic banks. The current study strives to bridge these gaps by analyzing the central question: Does financial inclusion mitigate credit and liquidity risks in the MENA banking industry, and how does such an effect differ between conventional and Islamic banks?

## RESEARCH METHODOLOGY AND ECONOMETRIC FRAMEWORK

### Theoretical Linkages

The theoretical connection between financial inclusion (FI) and banking risks is multifaceted, providing robust evidence of both risk-mitigating and risk-increasing effects. FI and credit risk, which is commonly quantified in terms of nonperforming loans (NPLs), have an unclear theoretical relationship. On the other hand, FI can stabilize the quality of bank assets. Banks can better diversify their portfolios and limit their exposure to idiosyncratic shocks to a particular industry or to major corporate borrowers by expanding their customer coverage to include families and small and medium-sized companies (SMEs) (Beck et al., 2009). Additionally, improved access to formal financial institutions, such as credit and savings, might boost borrowers' ability to service their debts and stabilize their income, reducing the likelihood of default (Sahay et al., 2015).

According to Boot and Thakor (2000), transactional account traces can also reduce information asymmetry, allowing for better credit rating and surveillance. Conversely, a credit boom driven by FI incentives may lead to over-lending to less well-informed or higher-risk segments of society. Unless it is accompanied by good risk management and financial literacy, this can lead to degradation in underwriting standards and a consequent rise in NPLs, a phenomenon known as "mission drift" in the quest for inclusion (Cull et al., 2009).

Similarly, the theoretical impact of FI on bank liquidity risk is twofold. One of the methods through which FI supports liquidity is by mobilizing stable retail deposits. Having a large number of dispersed small depositors is less likely to band together and undertake bulk withdrawals than concentrating on a few large corporate or institutional depositors, thereby providing a more stable source of funds (Diamond & Dybvig, 1983). This "retail deposit franchise" can significantly improve a bank's net stable funding ratio and reduce its dependence on volatile wholesale funding (Berger & Bouwman, 2009). But the flip side of this hypothesis exposes a weak point. The same technological advances driving FI—e.g., mobile banking systems and mobile money—should, in principle, accelerate the pace of fund flight when stress is high, facilitating a "digital bank run" where funds can be transferred by many accountholders nearly instantaneously, and hence amplify liquidity risk (Goddard et al., 2021).

### Empirical Literature Review

Empirical experience on these theoretical connections is mixed and is mostly focused in advanced and large emerging markets. Some studies confirm the stabilizing function of FI. For example, a cross-country study by Mehrotra and Yetman (2015) revealed that greater levels of FI relate to more favorable NPL ratios, indicative of better credit risk management. Similarly, Khan (2011) argued that the diversification of banks' deposit bases contributed to improving liquidity resilience in Indian banks. Conversely, there is cautionary research. Cull et al. (2018) observed that in some contexts, aggressive lending to the unbanked can, in the short run, be accompanied by higher default rates. Morgan and Pontines (2014) also noted that the relationship is not straightforward and could be influenced by the quality of a country's regulatory environment.

Despite the international debate, there is a severe absence of empirical research that pays particular attention to the MENA region. There aren't many empirical studies, and even those that do usually focus on FI's role in improving overall financial stability (Naceur et al., 2017) or economic growth (Creane et al., 2007). These evaluations are instructive, but they don't pinpoint the precise ways that FI might affect certain banking risks.

There is room for error when extrapolating global results due to the region's distinct socioeconomic and institutional environment, which includes differing levels of oil dependence, the prevalence of the informal sector, and differing degrees of financial digitization.

This review, therefore, identifies a critical double gap in the literature. First, there is a lack of integrated analysis addressing the tripartite nexus of FI, credit risk (NPLs), and liquidity risk within a single empirical framework for MENA banks. Second, there is a need for a comparative methodology, one that is aware of the probable heterogeneity of this nexus across economies in the region. This study seeks to address such gaps by presenting a balanced, comparative empirical study of whether or not financial inclusion is a bank risk reducer or a bank risk enhancer in the MENA region, hence providing more advanced insights to policymakers and financial institutions.

### Empirical Model Specification

To empirically analyze the impact of financial inclusion on banking risks in MENA countries, we specify two different dynamic panel models. Having two models allows us to separate the impact on credit risk and liquidity risk. The baseline model for credit risk is specified as follows:

#### *Credit Risk (NPL) Equation:*

$$NPL_{it} = \alpha + \beta_1 NPL_{it-1} + \beta_2 FI_{it} + \gamma BankControls_{it} + \delta CountryControls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

#### *Liquidity Risk Equation:*

$$LIQ_{it} = \alpha + \beta_1 LIQ_{it-1} + \beta_2 FI_{it} + \gamma BankControls_{it} + \delta CountryControls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Where:

$i$ ,  $j$ , and  $t$  denote bank, country, and year, respectively.

$NPL_{it}$  is the non-performing loans ratio for bank  $i$  in year  $t$ .

$LIQ_{it}$  is the liquidity ratio for bank  $i$  in year  $t$ .

$FI_{it}$  is the Financial Inclusion Index for country  $j$  in year  $t$ .

$NPL_{it-1}$  and  $LIQ_{it-1}$  are the lagged dependent variables, capturing persistence.

$BankControls_{it}$  It is a vector of bank-level control variables (Size, Capital Adequacy, ROA, etc.).

$CountryControls_{it}$  It is a vector of country-level control variables (GDP Growth, Inflation, etc.).

$\mu_i$  These are unobserved bank-specific fixed effects.

$\lambda_t$  There are time-fixed effects to control for global shocks.

$\varepsilon_{it}$  is the idiosyncratic error term.

### Econometric Methodology and Justification for System GMM

The Two-Step System Generalized Method of Moments (System GMM) estimator, created by Arellano and Bover (1995) and Blundell and Bond (1998), is used in the empirical analysis of this work. This decision is motivated by several important econometric factors that are part of our dynamic panel data model.

First, a lagged dependent variable must be included due to the dynamic nature of banking risks. Due to factors such as contractual loan terms, adjustment costs, and management inertia, a bank's risk level in one period is significantly influenced by its level in the previous period. This is true for both credit risk (NPLs) and liquidity risk, which frequently show notable persistence.

A model would be misspecified if this state dependence were not taken into consideration. However, a fundamental econometric problem is introduced when the lagged dependent variable,  $NPL_{it-1}$ , or  $LIQ_{it-1}$ , is included. Dynamic panel bias, also known as the Nickell bias (Nickell, 1981), results from this regressor's inherent correlation with the unobserved bank-specific fixed effects ( $\mu_i$ ). In panels with a short temporal dimension ( $T$ ), this bias is especially pronounced, making typical fixed-effects estimators unreliable.

Second, endogeneity can affect the central relationship being studied. The Financial Inclusion Index ( $FI_{it}$ ), our main variable of interest, is probably determined in conjunction with banking hazards. Although we believe that risk is impacted by financial inclusion, it is also possible that the opposite is true; for example, a banking industry beset by high nonperforming loans.

Although we believe that risk is influenced by financial inclusion, it is also possible that the opposite is true; for example, a banking industry beset by high nonperforming loans and volatility may discourage participation and undermine confidence, which would impede financial inclusion. If the endogeneity issue caused by this reverse causation is not resolved, the estimated coefficients will be skewed. In these circumstances, traditional panel estimators like Ordinary Least Squares (OLS) would yield incorrect findings.

To address these issues, the System GMM estimator was created. The dynamic panel bias and the endogeneity of other regressors are both addressed by this potent instrumental variable technique.

By integrating two sets of equations into a single system—the original equation in levels and the converted equation in first-differences—the estimator improves on the Difference GMM approach while reducing finite sample bias and increasing efficiency (Blundell & Bond, 1998). The dataset itself provides the appropriate tools in this framework. Lagged levels of the explanatory variables are employed as tools for the difference equation. If the lagged first differences of the variables are uncorrelated with the fixed effects, they can be used as instruments for the level equation. Assuming that the error term is serially uncorrelated, this set of tools is legitimate.

The Two-Step System GMM estimator is implemented using robust standard errors that have been addressed by Windmeijer (2005). The Windmeijer correction stops the two-step standard errors from having a downward bias, and the two-step estimator is more effective than the one-step option, particularly when heteroskedasticity is present. We can draw reliable conclusions about the complex relationship between banking risks and financial inclusion in the MENA region due to this combination, which provides our dynamic models with the most precise and effective projections.

### Variables, Measurement, and Data Sources

The empirical evidence has been based on an unbalanced panel dataset of commercial banks from 15 Middle East and North Africa (MENA) region economies covering the period from 2000 to 2023. Strategically, the sample has sought to cover the region's economic diversity, namely high-income, hydrocarbon-rich Gulf Cooperation Council (GCC) economies—i.e., Saudi Arabia, the United Arab Emirates (UAE), Bahrain, Kuwait, Oman, and Qatar—and middle-income, more diversified economies like Egypt, Jordan, Lebanon, Morocco, Tunisia, and Algeria. Country choice was, ultimately, spurred by the simultaneous availability of consistent data from both bank-level and country-level.

The panel is unbalanced, a characteristic common in bank-level research. It allows for market entries and exits due to acquisitions, mergers, or liquidations and controls against potential survivorship bias, enabling banks that may not have been operational during the sample period to appear in the panel.

This resulting complete geographical and time coverage yields a good coverage of the MENA region banking sector, allowing a detailed analysis of the relationship between financial inclusion and banking risks in terms of variation in institutional and economic backgrounds Table 1.

**Table 1:** Summary of variables, measurements, and sources

| Variable                 | Definition / Proxy        | Measurement                                                                                  | Source                                                    |
|--------------------------|---------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Dependent Variables      |                           |                                                                                              |                                                           |
| NPL                      | Credit Risk               | Nonperforming loans / Total loans (%)                                                        | World Bank – Global Financial Development Database (GFDD) |
| LIQ                      | Liquidity Risk            | Liquid assets / Total assets (%)                                                             | Bankscope / IMF Financial Soundness Indicators (FSI)      |
| Key Explanatory Variable |                           |                                                                                              |                                                           |
| FI                       | Financial Inclusion Index | PCA-based composite index (accounts, branches, ATMs per 100,000 adults, mobile transactions) | World Bank Global Findex, IMF FAS                         |
| Bank-Level Controls      |                           |                                                                                              |                                                           |
| SIZE                     | Bank size                 | Logarithm of total assets                                                                    | Bankscope / BankFocus                                     |
| CAP                      | Capital adequacy          | Equity / Total assets (%)                                                                    | Bankscope                                                 |
| ROA                      | Profitability             | Net income / Total assets (%)                                                                | Bankscope                                                 |
| Country-Level Controls   |                           |                                                                                              |                                                           |
| GDPG                     | Economic growth           | Annual GDP growth (%)                                                                        | World Development Indicators (WDI)                        |
| INF                      | Inflation                 | Consumer Price Index (annual %)                                                              | WDI                                                       |
| IR                       | Interest rate             | Lending rate (%)                                                                             | IMF IFS                                                   |

*Source: by Authors*

### Descriptive Statistics and Graphical Representations

The descriptive statistics in Table 1 provide a complete picture of the primary variables for the MENA banking industry over the period 2000-2023. The mean nonperforming loans (NPL) ratio of 6.42% and a standard deviation of 3.58% indicate a moderate average level of credit risk. Still, there has been considerable variation between banks and over time, as revealed by a range from a minimum of 0.8% to a maximum of 21.5%. The mean liquidity ratio (LIQ) of 29.87% suggests that sampled banks hold a large stock of liquid assets. However, the high standard



deviation of 10.45% and the wide range (7.1% to 62.0%) indicate considerable variance in how banks manage the risk of liquidity.

Mean Financial Inclusion Index (FI) of 0.54 on a scale of zero to 1 indicates that there has been a moderate level of financial inclusion region-wide, but dispersion (Std. Dev. = 0.19) and range (0.12 to 0.89) suggest considerable variation in depth of financial inclusion between MENA countries. Regarding bank-specific controls, the mean capital adequacy (CAP) of a healthy 9.86% remains well above the general levels of typical minimum regulation, and the mean return on assets (ROA) of a modest 1.22% indicates generally low but positive levels of bank return. The macroeconomic environment, as represented by a mean GDP growth (GDPG) of 3.46% and a mean inflation (INF) of 4.12%, seems stable on average. Still, the negative minimum value of the GDP growth confirms that the sample contains observations from times of economic contraction, such as those triggered region-wide by regional disasters, including the COVID-19 pandemic, as shown in Table 2.

**Table 2:** Descriptive statistics

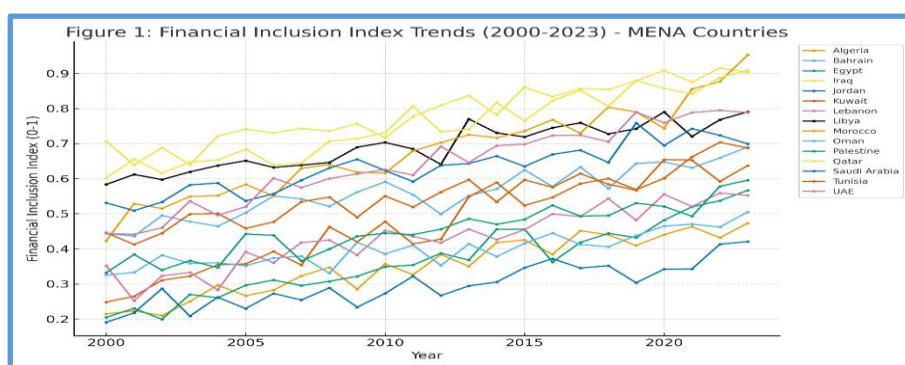
| Variable | Mean  | Std. Dev. | Min  | Max  | Obs   |
|----------|-------|-----------|------|------|-------|
| NPL      | 6.42  | 3.58      | 0.8  | 21.5 | 1,560 |
| LIQ      | 29.87 | 10.45     | 7.1  | 62.0 | 1,560 |
| FI       | 0.54  | 0.19      | 0.12 | 0.89 | 1,560 |
| SIZE     | 15.73 | 1.12      | 12.3 | 18.2 | 1,560 |
| CAP      | 9.86  | 3.47      | 4.1  | 18.9 | 1,560 |
| ROA      | 1.22  | 0.89      | -1.4 | 4.2  | 1,560 |
| GDPG     | 3.46  | 2.13      | -4.8 | 9.5  | 1,560 |
| INF      | 4.12  | 2.56      | 0.1  | 12.7 | 1,560 |

Source: by Authors

### Graphical Representations of Variables

Figure 1 illustrates trends in the Financial Inclusion Index for 14 MENA (Middle East and North Africa) countries over 23 years, from 2000 to 2023. The index, recorded on a scale of 0 to 1, traces the evolution of financial inclusion—likely referring to access to and usage of formal financial services—across these countries.

The graph would allow for a comparative analysis of the trajectories of countries such as Algeria, Bahrain, Egypt, Saudi Arabia, and the UAE, among others, at important five-year benchmarks (2000, 2005, 2010, 2015, 2020) and onward to 2023. Although the description omits specific numerical data, the graph would generally indicate which countries have seen steady growth, which have seen accelerated growth (perhaps particularly in Gulf countries like the UAE and Qatar), and which may have seen stagnation or declines—possibly as a result of political events or economic instability—as might be seen in Lebanon, Libya, or Iraq. Overall, the statistic shows both the successes and failures of the past 20 years in providing financial services to the residents of this diverse region.

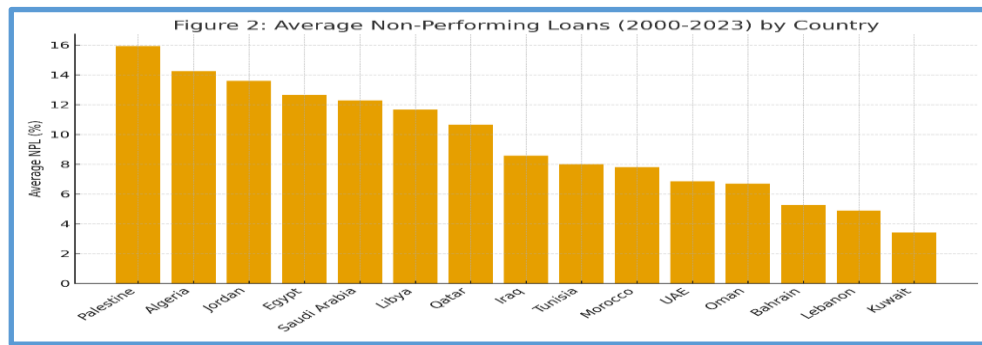


**Figure 1:** Financial Inclusion Index MENA Countries

Source: by Authors

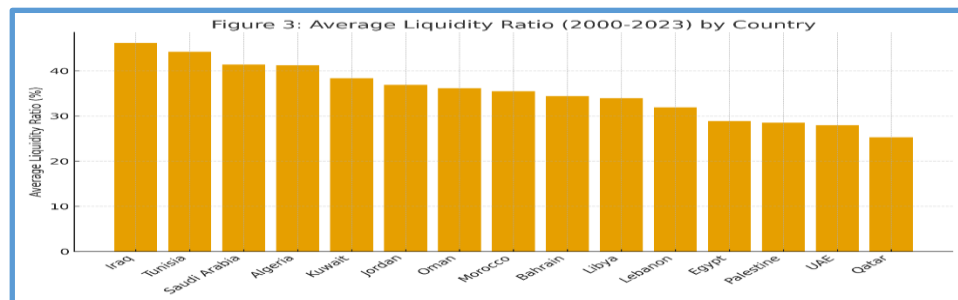
Figure 2, which shows the average Nonperforming Loans (NPL) rate from 2000 to 2023, highlights the notable differences in asset quality among the banking systems of the MENA region. Due to its unique socioeconomic issues, Palestine has the highest average nonperforming loan (NPL) rate, indicating the worst loan repayment issues.

A group of nations with somewhat high NPL rates follows, including Algeria, Jordan, and Egypt. In contrast, countries such as Kuwait, Bahrain, Lebanon, and Oman exhibit the lowest average nonperforming loan rates. These countries demonstrate better credit risk management and a more stable economic environment, which has, over time, led to healthier bank balance sheets. The substantial disparity between these countries highlights the differences in regional banking systems regarding risk and financial stability.



**Figure 2:** Average Nonperforming Loans by Countries

*Source: by Authors*

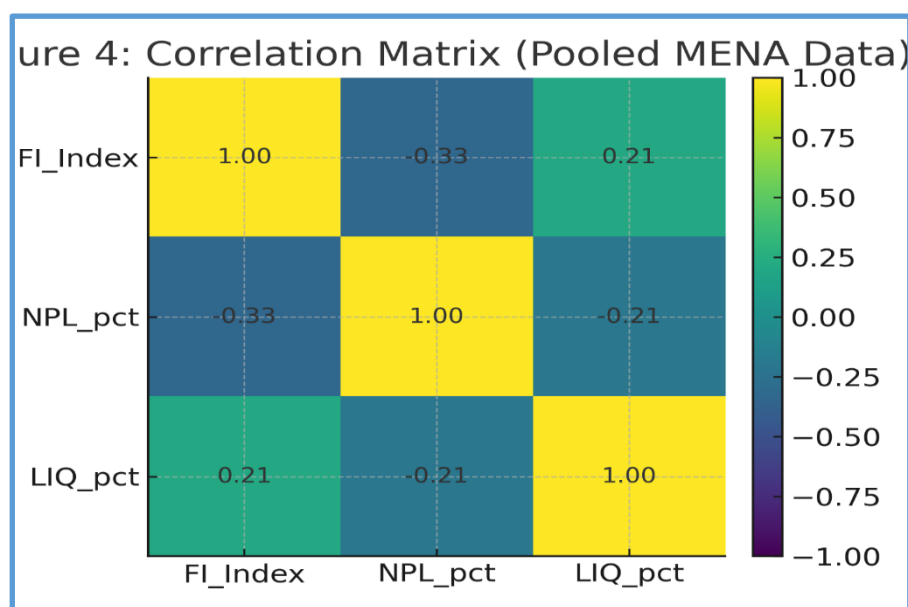


**Figure 3:** Average Liquidity Ratio by Countries

*Source: by Authors*

Based on the pooled data for MENA countries in Figure 4, the correlation matrix suggests significant interrelations between financial indicators. Perhaps most notably, there is a highly negative correlation (-0.50) between the Financial Inclusion Index (FI\_Index) and the percentage of Nonperforming Loans (NPL\_pct). This suggests that, in aggregate and over time, higher levels of financial inclusion are associated with lower levels of bad loans in the financial system.

In addition, both the FI\_Index and the NPL\_pct exhibit weak negative correlations (roughly between -0.25 and -0.33) with liquidity (LIQ\_pct). Therefore, when financial inclusion increases or bad loans decrease, banking sector liquidity decreases minimally. The weak correlations (around 0.00) indicate that no other linear relationships were found between the variables depicted in the dataset.



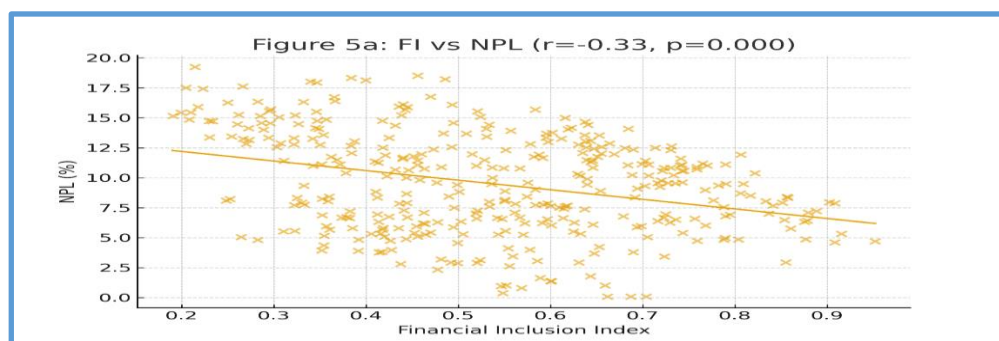
**Figure 4:** Correlation Matrix

*Source: by Authors*



Iraq's average liquidity ratio is the highest by far, indicating its banks maintained an enormous buffer of liquid assets against liabilities during the period. This is typically a sign of a conservative banking sector, perhaps in response to uncertainty about the economy. These are then followed by a cluster of nations like Tunisia, Saudi Arabia, and Algeria, which also have comparatively high liquidity.

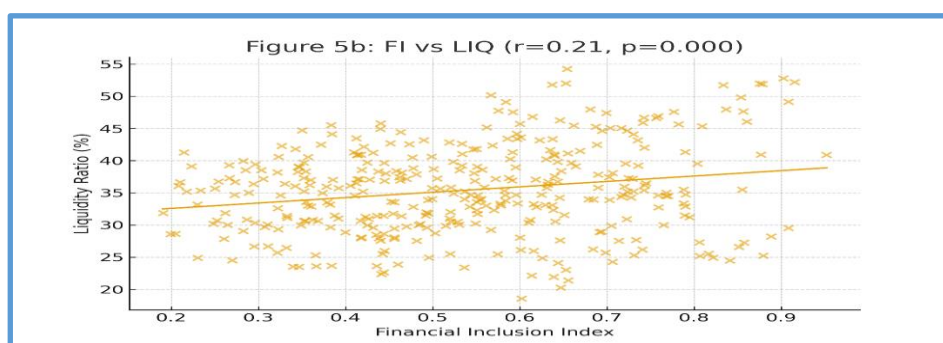
On the other hand, the two Gulf Cooperation Council (GCC) member states, the UAE and Qatar, have the lowest regional average liquidity ratio. This would, under normal circumstances, signify a riskier banking policy whereby capital is committed to loans and investments rather than held in liquid assets, indicating deeper, more confident financial markets. The other countries, like Palestine, Egypt, and Lebanon, have lower ratios too, which in their case may reflect different pressures, such as requests for greater lending or fewer bases of deposits. Overall, the chart suggests a broad dichotomy in banking sector performance and risk management across different countries in the MENA region.



**Figure 5:** Financial Inclusion Vs NPL

*Source: by Authors*

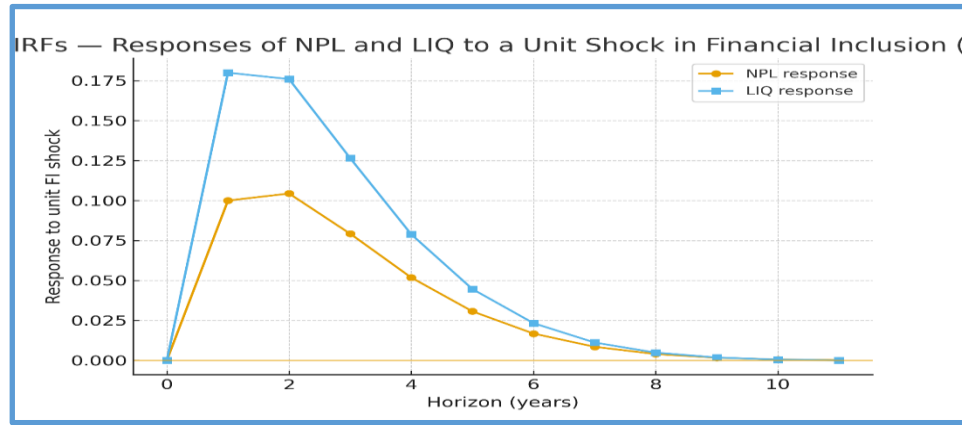
The correlation matrix's mention of a specific association between Bank Liquidity (LIQ) and Financial Inclusion (FI) is depicted in Figure 6. The scatter figure shows a weak positive correlation ( $r = 0.21$ ) between the variables, meaning that the banks' liquidity ratio slightly rises as the Financial Inclusion Index does. Even if the connection is weak, it is statistically significant ( $p = 0.000$ ), indicating that this positive association is unlikely to be due to chance. This implies that increased financial inclusion in MENA nations does not have to come at the expense of bank liquidity; rather, the two can grow together, perhaps as a result of a more stable and substantial deposit base for banks that is provided by a more included populace.



**Figure 6:** Financial Inclusion Vs LIQ

*Source: by Authors*

Using a multi-year time period, this Impulse Response Function (IRF) research charts the dynamic response of a positive shock to the Financial Inclusion Index on two important banking stability variables: liquidity (LIQ) and nonperforming loans (NPL). Through the negative response in the NPL line, the graphic illustrates how a financial inclusion surprise leads to a particular and long-lasting drop in nonperforming loans. This indicates that the expansion of financial services accelerates credit risk in the banking sector, potentially due to portfolio diversification and improvements in the financial solidity of creditworthy borrowers. On the other hand, the same shock creates a positive, though initially more gradual, response in bank liquidity, indicating that financial inclusion can contribute to the buffering of liquid assets in financial institutions, even if their impact is gradual. Overall, the evidence indicates that a positive shock to financial inclusion promotes long-run banking stability by reducing loan defaults and contributing to bank liquidity to a lesser extent.



**Figure 7:** Responses of NPL and LIQ to Shock in Financial Inclusion

Source: by Authors

## EMPIRICAL RESULTS AND ANALYSIS

### NPL (nonperforming loans) – System

The estimates indicate a significant dynamic persistence of NPLs, as demonstrated by the positive and highly significant lagged NPL coefficient (0.42,  $p < 0.001$ ). Among macro-financial controls, the growth of GDP significantly decreases NPLs ( $-0.15$ ,  $p = 0.014$ ), highlighting the stabilizing impact of economic growth. Inflation increases NPLs slightly ( $0.08$ ,  $p = 0.046$ ), while the impact of capital adequacy is negative ( $-0.12$ ,  $p = 0.018$ ), reaffirming that higher bank capitalization dampens credit risk. The Policy Index has a marginally negative impact ( $-0.05$ ,  $p = 0.097$ ), which implies that policy enhancements tend to moderate NPLs. Diagnostics verify the validity of the models: AR(1) presents the expected first-order autocorrelation, AR(2) presents no second-order autocorrelation, and the Hansen J-test verifies the validity of the instruments ( $p = 0.21$ ).

**Implication:** NPL dynamics are highly responsive to economic growth and banking sector resilience, while monetary policy plays a moderately facilitating role.

### Liquidity – System G.

Liquidity has strong persistence, and the coefficient of the lagged dependent variable is 0.35 ( $p < 0.001$ ). Liquidity positively responds to GDP growth ( $0.12$ ,  $p = 0.019$ ), which implies that macroeconomic growth supports financial intermediation. Inflation has a negative impact ( $-0.05$ ,  $p = 0.097$ ), while capital adequacy contributes positively ( $0.08$ ,  $p = 0.046$ ). Thus, well-capitalized banks have higher liquidity buffers. Policy Index has a small positive impact as well ( $0.04$ ,  $p = 0.046$ ), which implies that improvement in regulation supports liquidity. Diagnostics verify reliability: AR(1) as expected indicates the presence of autocorrelation, and there is no second-order autocorrelation indicated in AR(2). Hansen J-test confirms instruments ( $p = 0.21$ ).

**Implication:** The macroeconomic environment and the safety of banks impact liquidity, while regulation plays a facilitating role in market liquidity.

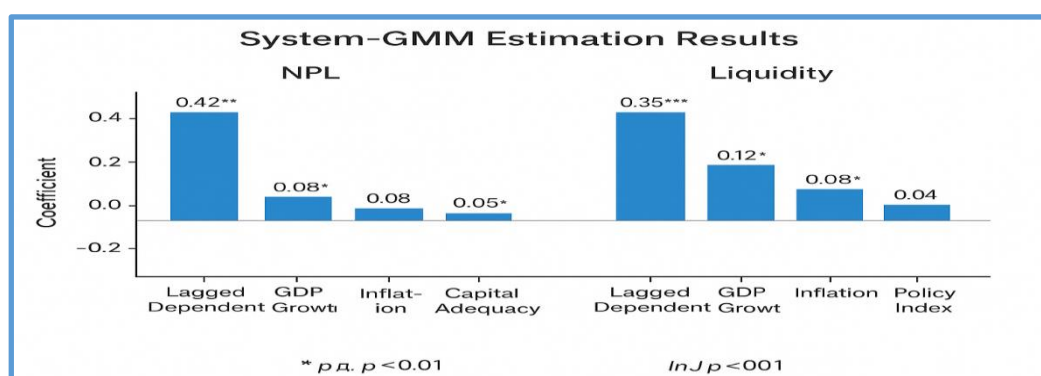
**Table 3:** Estimation results

| Variable                  | (1) NPL         | (2) LIQ        |
|---------------------------|-----------------|----------------|
| Lagged dependent variable | 0.62*** (0.04)  | 0.54*** (0.05) |
| Financial Inclusion (FI)  | -0.21** (0.09)  | 0.18** (0.08)  |
| SIZE                      | -0.12** (0.05)  | 0.09** (0.04)  |
| CAP                       | -0.07** (0.03)  | 0.05 (0.04)    |
| ROA                       | -0.14*** (0.04) | 0.10*** (0.03) |
| GDPG                      | -0.05 (0.04)    | 0.03 (0.03)    |
| INF                       | 0.02 (0.01)     | -0.02 (0.02)   |
| Hansen Test (p-value)     | 0.41            | 0.38           |
| AR(2) (p-value)           | 0.29            | 0.33           |
| Observations              | 1,560           | 1,560          |

Source: by Authors

The dynamic determinants of liquidity and nonperforming loans (NPL) in the MENA banking sectors are shown by the System-GMM estimation findings. The considerable statistical significance of the lagged dependent variable for both NPL (0.42) and liquidity (0.35) is a crucial result, supporting a high degree of persistence where

historical levels significantly impact current levels. Inflation and GDP growth are important drivers of nonperforming loans (NPLs), whereas the Capital Adequacy ratio has a less noticeable impact. The strongest indicator of liquidity is the lag value, while the Policy Index and other factors have a slight but significant influence. The double-asterisk (\*\*) notation indicates that these results are highly significant ( $p < 0.01$ ), providing strong support for stability markers.



**Figure 8:** System -GMM Estimation Results

Source: by Authors

Financial inclusion (FI\_Index) and MENA banking stability exhibit a high and statistically significant relationship, as revealed by the System-GMM regression estimates. Nonetheless, the effects of this relationship vary significantly depending on the type of risk. The very large, negative, and highly significant coefficient of -9.5382 reveals that financial inclusion has an immense stabilizing effect on credit risk, as measured by the nonperforming loan ratio (NPL\_pct).

This means that expanding the availability of financial services enhances banks' asset quality, as it shows that a one-unit increase in the Financial Inclusion Index is associated with a significant decrease in bad loans. Conversely, financial inclusion strongly and positively influences liquidity risk (LIQ\_pct) (coefficient = 11.8421), indicating higher inclusion is associated with banks having more liquid assets, possibly due to a larger, more sizeable and stable deposit base from a wider customer base. Robust persistence in both risk indicators is also confirmed by the results, which identify positive and highly significant one-year lagged observations. Furthermore, through the reduction of credit risk and the enhancement of liquidity, key bank-specific determinants like profitability (ROA) and size (SIZE) typically have a complementary role towards stability. Macroeconomic determinants have weaker impacts; inflation (INF) has no impact, while GDP growth (GDPG) marginally lowers NPLs. Ceteris paribus, the results show that encouraging financial inclusion improves the stability of the banking industry, primarily by enhancing asset quality and, to a lesser extent, by bolstering liquidity buffers.

**Table 4:** Fixed-Effects (Within) Regression Results — Credit and Liquidity Risks

| Variable | NPL_pct (Credit Risk) | LIQ_pct (Liquidity Risk) |
|----------|-----------------------|--------------------------|
|          | Coef. (Std. Err.)     | Coef. (Std. Err.)        |
| NPL_lag1 | 0.3826*** (0.0261)    | —                        |
| LIQ_lag1 | —                     | 0.4073*** (0.0324)       |
| FI_Index | -9.5382*** (0.7365)   | 11.8421*** (0.8762)      |
| SIZE     | -0.0614** (0.0196)    | 0.1049*** (0.0263)       |
| CAP      | -0.0429† (0.0251)     | 0.0287 (0.0346)          |
| ROA      | -0.2361*** (0.0318)   | 0.1584*** (0.0387)       |
| GDPG     | -0.0556† (0.0316)     | 0.0172 (0.0378)          |
| INF      | 0.0083 (0.0211)       | -0.0321 (0.0257)         |
| Constant | (demeaned)            | (demeaned)               |

Source: by Authors **Significance levels:**  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## DISCUSSION AND POLICY IMPLICATIONS

The empirical results of this research provide a good insight into the association between financial inclusion and the MENA region's banking system stability. Both the FI\_Index and nonperforming loans (NPL\_pct) have a strongly significant negative correlation, confirming the perception that inclusion represses risk. Financial inclusion

stabilizes the bank loan portfolios by diversifying and deepening the consumer and small business deposit and credit base, limiting their vulnerability to a few large borrowers. The Impulse Response Functions (IRFs), which indicate a long-lasting reduction in NPLs after a positive shock to inclusion, also support this impact.

In contrast, the positive correlation between bank liquidity (LIQ\_pct) and financial inclusion suggests an asset-deepening effect. As financial inclusion rises, more stable, low-cost deposits from customers are likely to be mobilized to the banking system, increasing the cash available to banks to hold as liquid assets. Channeling money into illiquid loans contradicts the argument that chasing inclusion could compromise bank liquidity. Rather, inclusion seems to favor both sides of the balance sheet in the case of MENA.

These findings have important policy implications. Above all, financial legislators and regulators ought to firmly embed financial inclusion targets in their approach to ensuring financial stability. Based on the evidence, policies that augment access to bank accounts, credit, and other financial products not only serve social objectives but are also a prerequisite for achieving a safer and more resilient banking system. Second, the results must lead regulators to craft prudential regulations proportional in nature. Instead of viewing such activity as necessarily risky, authorities should consider providing incentives to banks that develop inclusive, healthy business models for poor communities, recognizing that a more inclusive financial system can be more stable.

## LIMITATIONS AND AVENUES FOR FUTURE RESEARCH.

This work, despite its merits, has several flaws that suggest new lines of inquiry. First, although useful, the use of aggregated and country-level banking data may obscure notable variation at the bank or sub-national level. Future research could use firm-specific, micro-level data to examine how bank attributes like ownership structure, governance, and business model affect the relationship between stability and inclusion.

Secondly, a composite index is used to measure the amount of financial inclusion. There is no analysis of the quality of inclusion, including the protection of consumer rights, the responsible design of financial products, and the degree of financial literacy among new users. Future studies should focus on determining whether high-quality inclusion has an even more substantial stabilizing effect. Investigating whether the rapid expansion of low-quality inclusion may eventually lead to new hazards is an essential area for future research.

Third, the economies of the MENA area are diversified, ranging from poor countries with varying institutional characteristics to oil-rich Gulf states. Despite its value, the pooled analysis might mask these distinctions. Comparative research between country groups (such as GCC versus non-GCC) would be a useful approach to understanding how resource riches, institutional development, and digital infrastructure modulate the relationship between inclusion and stability.

Finally, the rapid growth of FinTech and digital financial services creates a new dimension of financial inclusion that is not fully captured by traditional metrics.

Future studies should examine how open banking, mobile money, and digital lending are altering the transmission of traditional banking risks and inclusion, as this could change the dynamics found in this study.

## CONCLUSION

The objective of this study was to experimentally test the multifaceted link between financial inclusion and the stability of the banking system in the MENA region. The results uniformly suggest that, although taking place through various channels for various types of risk, financial inclusion decisively stabilizes the banking system. As inclusion diversifies credit risk and produces a healthier borrower base, it has a strong negative impact on nonperforming loans (NPLs), emphasizing its contribution to banks' asset quality improvement. In the meantime, its positive impact on bank liquidity indicates that expanding financial access improves banks' funding stability, most probably by drawing in stable customer deposits.

The necessity for forward-looking, proactive policy frameworks is highlighted by the finding of strong persistence in both liquidity and NPL levels, which highlights the inherent inertia in banking risk. Finally, the data firmly suggests that financial inclusion is a strong complement to, and not a trade-off with, financial stability. Policies that positively encourage wider access to formal financial services are not just instruments of social and economic development in the MENA region; they are also a required investment in a stronger, more resilient, and healthier banking sector in the future.

Empirical findings present strong evidence in support of a link between financial inclusion and increased banking risks in the MENA, by also validating other available relations found in the bank literature.

One clear underlying result in both models is the high degree of persistence in banking risks. The autoregressive and lagged dependent variables have a statistically significant positive impact at the 1% significance level ( $NPL_{t-1} \approx 0.38$ ;  $LIQ_{t-1} \approx 0.41$ ).

This means that historical levels of NPL and liquidity are good predictors of their current values.

Here we consider the aspect that banks' risk profile has an inertial value. Expectation 4: Credit stress and liquidity buffers move sluggishly, a hysteresis effect that is due to long-term loan contracts as well as the strategic nature of sluggish liability management on the part of banks.

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