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# The Impact of FinTech on Bank Stability and Cyber Risk in Small Developing Economies: Evidence from Jordan

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***Abstract***: *With the increasing adoption of financial technologies such as mobile banking, digital payment systems, and blockchain applications, the banking sector in small developing economies is undergoing profound structural and operational transformations that generate both opportunities and emerging risks. This study examines the impact of FinTech adoption on bank stability and cyber risk in Jordan over the period from 2000 to 2024. Using a fixed-effects model, the analysis is complemented by robustness checks employing random effects, pooled ordinary least squares (OLS), and the generalized method of moments (GMM). The empirical investigation focuses on seven Jordanian financial institutions, including commercial banks and non-bank financial institutions. The study evaluates the influence of FinTech adoption while controlling for key bank-specific characteristics that may affect financial stability and exposure to cyber risk. The results reveal that FinTech adoption significantly enhances bank stability while simultaneously mitigating cyber risk, indicating a positive contribution of digital financial innovation to the resilience of the banking sector. These findings suggest that banks operating in Jordan and similar small developing economies should continue to expand their strategic investments in FinTech while strengthening cybersecurity capabilities. Furthermore, the study underscores the importance of proactive regulatory oversight and institutional frameworks to ensure that FinTech-driven transformation supports financial stability and safeguards against digital vulnerabilities.*

**Keywords:** FinTech adoption; bank stability; cyber risk; fixed effects; Jordan

## 1. Introduction

Financial markets are undergoing substantial transformations driven by the rapid emergence and diffusion of financial technology (FinTech), which has disrupted traditional banking models and reshaped the structure and functioning of financial systems worldwide (1). FinTech refers to the application of innovative digital technologies to deliver financial services in more efficient, secure, and accessible ways, encompassing a wide range of products such as mobile banking, digital payments, blockchain-based services, and data-driven financial solutions (2). While advanced economies have been at the forefront of FinTech adoption, its implications for banking systems in small developing economies remain relatively underexplored, particularly with respect to financial stability and emerging cyber risks. Small developing economies, such as Jordan, face distinct structural and institutional challenges, including limited market size, high exposure to external shocks, and constrained financial diversification, which may amplify both the benefits and risks associated with FinTech adoption (3). As FinTech penetration deepens in these contexts, assessing its consequences for bank stability and vulnerability to cyber risk becomes increasingly important. FinTech encompasses a broad spectrum of digital financial innovations, including mobile banking platforms, electronic payment systems, peer-to-peer (P2P) lending, blockchain applications, and artificial intelligence-driven financial analytics (4). These technologies have the potential to enhance financial inclusion, lower transaction costs, and improve the efficiency of financial intermediation, particularly in developing economies with growing demand for digital services (5). From a banking perspective, FinTech can strengthen stability by improving risk assessment accuracy, enhancing monitoring capabilities, and streamlining internal processes through automation and data analytics (6). Automated credit scoring systems, real-time transaction monitoring, and advanced data-driven decision tools enable banks to manage credit and operational risks more effectively, thereby reducing non-performing loans and supporting overall financial resilience (7). Big data analytics, in particular, allows banks to better understand customer behavior and financial profiles, contributing to more prudent lending decisions and improved stability. Despite these advantages, FinTech adoption also introduces new and complex risks, most notably cyber risk, regulatory challenges, and intensified competitive pressures, which may pose significant threats to banking stability in small developing economies (8). One of the most profound transformations brought about by FinTech relates to the acceleration of financial transactions and settlement processes (9). Traditional time lags in payment processing have been replaced by near-instantaneous transactions across digital platforms, enhancing efficiency and customer convenience. However, this compression of transaction time reduces the window available for fraud detection and risk mitigation, thereby increasing banks' exposure to cyberattacks, data breaches, and real-time payment fraud (10). As digital financial ecosystems expand, managing these time-sensitive cyber risks has become a critical concern for banks, regulators, and policymakers. FinTech contributes to cyber and operational risks through several channels. First, the expansion of digital banking services, mobile applications, and online payment platforms increases the number of digital access points, each representing a potential vulnerability to cyber threats (11). Second, many FinTech services operate across borders, complicating regulatory enforcement and supervisory coordination due to differences

in legal frameworks and cybersecurity standards across jurisdictions (12). Third, FinTech firms often benefit from lower operating costs, higher technological agility, and digital-first business models, intensifying competition with traditional banks in areas such as payments, remittances, and consumer lending (13). In response to these competitive pressures, banks may accelerate digital transformation initiatives, sometimes without fully developed cybersecurity and governance frameworks, thereby increasing their exposure to cyber risk. Jordan's banking sector is relatively small but well regulated, comprising commercial banks and non-bank financial institutions (NBFIs) operating under the supervision of the Central Bank of Jordan (CBJ). The sector includes both locally owned and foreign-owned banks, with a growing emphasis on digital banking services, electronic payments, and financial technology partnerships. Over the past decade, Jordan has witnessed significant growth in digital financial services, supported by national initiatives such as e-payments infrastructure, mobile wallets, and regulatory sandboxes aimed at fostering FinTech innovation. Despite these advancements, the sector faces challenges related to cybersecurity readiness, operational resilience, and risk governance, particularly as digital transactions become increasingly dominant within the financial system. Historically, the Jordanian banking sector has confronted structural challenges including moderate levels of financial inclusion, reliance on traditional banking channels, and limited diversification of financial products. Recent technological developments, however, have begun to reshape the financial landscape. Digital payment platforms, mobile wallets, and online banking services have expanded access to financial services and improved transaction efficiency. The integration of digital payment systems into the national payments infrastructure has reduced information silos and enhanced interoperability between banks and FinTech providers, promoting financial inclusion and efficiency. Recognizing these developments, the CBJ has introduced regulatory reforms to support digital finance while strengthening oversight of cybersecurity, risk management, and consumer protection. Nonetheless, FinTech adoption remains uneven, presenting both opportunities for enhanced stability and challenges related to cyber vulnerability. Ensuring financial system soundness remains a central objective of the CBJ, which implements prudential regulations aligned with international standards, including capital adequacy requirements, risk management frameworks, and supervisory guidelines for digital financial services. The regulatory framework has increasingly incorporated cybersecurity considerations, emphasizing data protection, Know Your Customer (KYC) requirements, and anti-money laundering and counter-terrorism financing (AML/CFT) compliance. While these measures aim to mitigate digital risks, the rapid pace of FinTech innovation continues to test the capacity of regulatory institutions and banks to manage emerging cyber threats effectively. Given the small size of the Jordanian economy and its exposure to regional and global economic fluctuations, the banking sector remains particularly sensitive to external shocks. Limited opportunities for portfolio diversification and increasing digital interconnectivity heighten the importance of maintaining bank stability and managing cyber risk. FinTech adoption, while offering efficiency gains and innovation, has the potential to reshape banks' risk profiles in fundamental ways. Understanding the relationship between FinTech adoption, bank stability, and cyber risk is therefore essential for fostering a resilient and sustainable banking system in small developing economies. The existing literature on Jordan's banking sector has primarily focused on traditional performance indicators such as profitability, efficiency, credit risk, and financial stability. While these studies provide valuable insights into the conventional determinants of banking performance, empirical evidence on the role of FinTech—particularly its implications for bank stability and cyber risk—remains limited. As digital financial technologies continue to transform banking operations globally, examining their effects within a small developing economy such as Jordan is both timely and necessary. This study contributes to the literature by providing one of the first empirical investigations into the impact of FinTech adoption on bank stability and cyber risk in Jordan over the period 2000–2024. Employing a fixed effects estimator and conducting robustness checks using random effects, pooled OLS, and GMM techniques, the analysis offers robust evidence on the role of FinTech in enhancing banking sector resilience while addressing emerging digital vulnerabilities. The findings provide important insights for policymakers, regulators, and banking institutions seeking to balance innovation with financial stability in small developing economies. The remainder of the paper is organized as follows. Section 2 reviews the relevant literature on FinTech, bank stability, and cyber risk. Section 3 outlines the data and methodology. Section 4 presents the empirical results, and Section 5 concludes with key policy implications.

## 2. Literature Review and Hypothesis Development

### 2.1. Linking FinTech and Bank Stability

The relationship between FinTech adoption and bank stability has attracted growing scholarly attention, with theoretical perspectives offering competing predictions regarding its net effect on financial system soundness. One strand of the literature draws on competition-based theories, suggesting that FinTech-driven competition may undermine bank stability by eroding traditional revenue sources and weakening banks' charter values. According to the charter value hypothesis, intensified competition—whether from FinTech firms or digital banking platforms—reduces banks' market power and long-term franchise value, thereby diminishing the costs associated with failure (14). As charter values decline, banks may become more vulnerable to instability, particularly if competitive pressures compress margins and limit their capacity to absorb shocks. This perspective aligns with earlier arguments that increased competition can destabilize banks by encouraging aggressive strategies and reducing buffers against adverse economic

conditions (15). In contrast, an alternative theoretical perspective emphasizes the stabilizing role of competition and technological innovation. Drawing on the competition-stability hypothesis, this view argues that FinTech adoption can enhance bank stability by improving operational efficiency, lowering borrowing costs, and strengthening risk management practices (16). Digital financial technologies enable banks to process information more accurately and in real time, thereby reducing information asymmetries and improving credit allocation. Lower lending rates and more precise borrower screening can decrease default probabilities, contributing to greater systemic stability (17). Moreover, increased competition induced by FinTech may reduce excessive market concentration and mitigate moral hazard associated with "too-big-to-fail" perceptions (18). Empirical evidence has shown that more competitive and technologically advanced banking systems tend to exhibit lower failure rates and greater resilience to shocks (19). Empirical findings on the FinTech–stability nexus remain mixed. Some studies suggest that FinTech development may weaken bank stability by increasing operational complexity and competitive pressure. For example, Bakker et al. (20) reported that FinTech expansion heightened financial fragility in emerging and developing economies. Similarly, Wang et al. (21) found that rapid FinTech growth in China intensified vulnerabilities within the banking sector. Fang et al. (22) also documented that FinTech-driven liquidity creation could exacerbate instability under certain conditions. Evidence from global samples further suggests that FinTech may strain traditional banking models if regulatory and institutional frameworks are insufficiently developed (23). Conversely, a growing body of research supports the view that FinTech adoption strengthens bank stability by enhancing efficiency, diversification, and risk management capabilities. Banna et al. (24) found that FinTech development reduced instability among microfinance institutions in Sub-Saharan Africa. Cheng and Qu (9) showed that digital banking technologies lowered credit risk and supported financial stability in China. C. Li et al. (7) documented a stabilizing effect of FinTech through improved information processing and income diversification. In the context of Jordan, Kayed et al. (2025) reported that FinTech innovations contributed to a more stable banking environment by improving credit capacity and operational efficiency. These findings suggest that, when effectively integrated, FinTech can enhance banks' resilience and support overall financial stability. Based on the above theoretical and empirical arguments, this study posits that FinTech adoption plays a stabilizing role in the banking sector of small developing economies.

**H1. Bank FinTech adoption is positively associated with bank stability.**

### 2.2. Linking FinTech and Cyber Risk

The relationship between FinTech adoption and cyber risk can be examined through the lenses of digital transformation theory and technology spillover theory. Digital transformation theory emphasizes that the increasing reliance on digital infrastructures fundamentally reshapes organizational risk profiles by expanding technological complexity and interconnectivity (5). As banks adopt FinTech solutions such as mobile banking, digital payments, cloud computing, and blockchain applications, they become more exposed to cyber threats, including data breaches, system intrusions, and fraud (6). From this perspective, FinTech adoption may initially elevate cyber risk by increasing the number of digital access points and dependencies on third-party technology providers. FinTech innovations often prioritize speed, convenience, and scalability, which can inadvertently introduce vulnerabilities if cybersecurity measures and governance frameworks lag behind technological deployment (8). Digital platforms that facilitate real-time transactions compress response times for detecting and mitigating cyber incidents, increasing potential losses from cyberattacks (4). Moreover, cross-border digital financial services complicate regulatory oversight and coordination, further amplifying cyber risk exposure (Lehmann, 2020). These challenges are particularly salient in small developing economies, where institutional capacity and cybersecurity expertise may be relatively limited. At the same time, technology spillover theory suggests that FinTech adoption can ultimately mitigate cyber risk by enhancing banks' technological capabilities, monitoring systems, and data governance practices (Kayed et al., 2025). Advanced analytics, artificial intelligence, and machine learning applications enable banks to detect anomalies, prevent fraud, and respond more effectively to cyber threats (Elsaid, 2023). The integration of cybersecurity tools into digital banking platforms can strengthen resilience by improving threat detection accuracy and reducing response times. Empirical evidence indicates that investments in digital payment systems and secure financial infrastructures can improve transparency and reduce operational vulnerabilities when accompanied by robust risk management frameworks (7). Nevertheless, empirical findings on the FinTech–cyber risk relationship remain inconclusive. Some studies report that increased digitalization heightens exposure to cyber incidents, particularly in the early stages of FinTech adoption (6). Others find that mature FinTech ecosystems, supported by regulatory oversight and institutional learning, experience lower levels of cyber risk due to improved security standards and technological spillovers (20). In the context of developing economies, the net effect of FinTech on cyber risk is therefore an empirical question, contingent on the balance between technological expansion and cybersecurity preparedness. Given the ongoing digital transformation of banking systems in small developing economies such as Jordan, this study argues that effective FinTech adoption—supported by regulatory oversight and cybersecurity investment—can reduce banks' exposure to cyber risk.

**H2. Bank FinTech adoption is negatively associated with cyber risk.**

## 3. Data, Variable Definition, and Method

### 3.1. Data

This study employs an unbalanced panel dataset comprising seven financial institutions (FIs) operating in Jordan over the period from 2000 to 2024. The sample includes five commercial banks—Arab Bank, Housing Bank for Trade and Finance, Jordan Kuwait Bank, Bank of Jordan, and Cairo Amman Bank—along with two non-bank financial institutions (NBFIs) operating under the supervision of the Central Bank of Jordan (CBJ). These institutions represent a substantial share of Jordan's financial system and are actively engaged in digital banking and FinTech-related activities. The data used for empirical estimation are obtained from multiple authoritative sources, including the Central Bank of Jordan (2024), individual banks' audited annual reports, and the World Development Indicators (World Bank, 2024). Bank-level financial indicators are collected from published financial statements, while macroeconomic and structural control variables are drawn from international databases. This combination of sources ensures data reliability and consistency across the study period. Table 1 presents the definitions and sources of the dependent, independent, and control variables employed in the analysis.

**Table 1. Variable descriptions**

| Variable Category | Variable | Definition | Symbol | Selected Evidence | Data Source |
|---|---|---|---|---|---|
| Dependent Variables | Bank stability | Z-score computed using return on assets (ROA), equity-to-total assets, and the standard deviation of ROA | STAB | Kayed et al. (2025); Hafeez et al. (2022); Wang et al. (2021) | CBJ |
| | Cyber risk | Proxy measured by IT expenditure intensity, operational risk disclosure, or digital incident exposure | CYRISK | Von Solms (2021); Bouheni et al. (2023); Kayed et al. (2025) | Annual reports / CBJ |
| Independent Variable | FinTech adoption | Availability and intensity of mobile banking and digital financial services | FINTECH | Kayed et al. (2025); Alghadi (2024); Kumar & Rani (2024) | CBJ |
| Control Variables | Bank size | Natural logarithm of total assets | BSIZE | Sari & Hanafi (2025); Martínez-Malvar & Baselga-Pascual (2020) | CBJ |
| | Leverage ratio | Total liabilities divided by total assets | LEV | Zhang et al. (2025) | CBJ |
| | Gearing ratio | Total liabilities divided by total equity | GEA | Fatouh et al. (2024); Lusy et al. (2018) | CBJ |
| | Liquidity ratio | Total loans divided by total deposits | LIQ | Adelopo et al. (2018); Rahman et al. (2015) | CBJ |
| | Concentration ratio | Herfindahl–Hirschman Index based on loan market shares | HHI | Abel et al. (2023); Islam & Nishiyama (2016) | CBJ |

**Notes: CBJ = Central Bank of Jordan (2024); WDI = World Development Indicators (World Bank, 2024).**
**Source: Authors' compilation.**

Trends in key bank-specific indicators are illustrated in Figures A1–A4 (Appendix A). Figure A1 depicts the evolution of bank stability (Z-score) across the sampled institutions, revealing noticeable variation over time, particularly during periods of economic stress. Figure A2 presents total asset growth, indicating that large commercial banks consistently dominate the Jordanian banking sector, while NBFIs maintain comparatively smaller asset bases. Figure A3 illustrates loan portfolio dynamics, highlighting differences in credit expansion strategies across institutions. Figure A4 shows the evolution of non-performing loans, with elevated levels observed during periods of economic disruption, reflecting heightened credit and operational risks. Overall, these trends underscore the heterogeneous nature of bank stability and risk exposure within Jordan's financial system.

### 3.2. Dependent Variables

As stated earlier, this study employs two dependent variables: **bank stability** and **cyber risk**.

With regard to **bank stability**, the literature commonly adopts two main perspectives. The first perspective is rooted in corporate governance and financial stability theory, where stability is assessed in terms of a bank's distance from insolvency. Under this view, the **Z-score** is the most widely used indicator, as it captures the combined effects of profitability, capitalization, and earnings volatility (10). A higher Z-score indicates greater bank stability and a lower probability of insolvency. The second perspective is aligned with regulatory frameworks, particularly the Basel Accords, which emphasize capital adequacy and risk exposure measures. Indicators commonly used in this approach include the asset-to-capital ratio, risk-weighted assets, and liquidity-based measures (14). While these indicators are valuable from a supervisory standpoint, they largely reflect **ex-post regulatory outcomes** rather than banks' overall financial resilience. Following prior empirical studies (16), this study adopts the **Z-score** as the primary measure of bank stability, given its ability to capture forward-looking insolvency risk from a corporate governance perspective. The Z-score is calculated as follows:

$$\textbf{Z-score} = (\textbf{ROA} + \textbf{Equity-to-Total Assets}) / \sigma(\textbf{ROA})$$

A higher Z-score indicates greater bank stability.

Regarding **cyber risk**, this study conceptualizes cyber risk as a component of operational risk arising from banks' increasing reliance on digital technologies and FinTech platforms. Cyber risk reflects banks' exposure to threats such as data breaches, system disruptions, digital fraud, and technology-related operational failures (11). Consistent with recent empirical literature, cyber risk is proxied using indicators related to banks' digital exposure and operational risk disclosures, including IT-related risk intensity and technology-driven operational vulnerability (12). Higher values of the cyber risk proxy indicate greater exposure to digital and cybersecurity threats.

### 3.3. Independent Variable

Existing studies have employed various proxies to capture FinTech-related activities within the banking sector. Following prior research (13), this study measures **FinTech adoption** using a dummy variable that takes the value of one if a bank offers mobile banking or digital financial services and zero otherwise. This proxy reflects banks' engagement in FinTech-driven service delivery and digital transformation initiatives. The mechanisms through which FinTech adoption may influence bank stability and cyber risk are discussed in detail in the literature review section.

### 3.4. Control Variables

To reduce the likelihood of model misspecification, several control variables commonly used in the banking and financial stability literature are included:

**(a) Bank size:** Larger banks typically benefit from diversification across assets and activities, stronger risk management systems, and improved access to capital, which may enhance financial stability (22). However, increased size also introduces organizational complexity and systemic importance, potentially heightening vulnerability to operational and cyber risks (21). With respect to cyber risk, larger banks may face greater exposure due to more complex digital infrastructures, although they may also possess stronger cybersecurity capabilities. Hence, the effect of bank size on stability and cyber risk remains ambiguous.

**(b) Leverage ratio:** Higher leverage reduces equity buffers and increases banks' vulnerability to shocks, potentially undermining stability (19). From a cyber risk perspective, highly leveraged banks may have limited financial flexibility to absorb losses arising from cyber incidents. Conversely, efficient capital structures may enhance returns and support technological investment (16). Accordingly, the impact of leverage on bank stability and cyber risk is theoretically ambiguous.

**(c) Gearing ratio:** A higher gearing ratio reflects greater reliance on debt financing, increasing fixed obligations and sensitivity to adverse shocks, which may weaken stability (Bevan & Danbolt, 2002). From a cyber risk standpoint, elevated gearing may constrain banks' ability to invest in advanced cybersecurity infrastructure. Thus, a positive association between gearing ratio and cyber risk, and a negative association with stability, is expected.

**(d) Liquidity ratio:** A high loan-to-deposit ratio implies that a larger share of deposits is tied up in illiquid assets, increasing liquidity risk and potentially undermining stability during periods of stress (14). In the context of cyber risk, lower liquidity buffers may

exacerbate the impact of operational disruptions caused by cyber incidents. Empirical evidence on liquidity and stability remains mixed (13).

**(e) Concentration ratio:** Market concentration may influence bank stability through competing mechanisms. Under the competition-fragility hypothesis, increased competition erodes franchise value and weakens stability, while the competition-stability view suggests that excessive market power may increase risk-taking (19). Concentration may also affect cyber risk, as dominant banks with extensive digital networks may face heightened exposure to cyber threats. Hence, the impact of concentration on stability and cyber risk is ambiguous.

### 3.5. Empirical Model

Following the standard empirical literature, the following two models are estimated to examine the impact of FinTech adoption on bank stability and cyber risk:

$$STAB\_it = \beta0 + \beta1\ FINTECH\ it + \beta2\ BSIZE\_it + \beta3\ LEV\_it + \beta4\ GEA\_it + \beta5\ LIQ\_it + \beta6\ HHI\_it + \varepsilon\_it$$

$$CYRISK\_it = \beta0 + \beta1\ FINTECH\_it + \beta2\ BSIZE\_it + \beta3\ LEV\_it + \beta4\ GEA\_it + \beta5\ LIQ\_it + \beta6\ HHI\_it + \varepsilon\_it$$

where *i* and *t* denote bank and time dimensions, respectively, and εit\varepsilon_{it}εit represents the error term. **STAB** denotes bank stability measured by the Z-score, while **CYRISK** represents cyber risk. **FINTECH** captures FinTech adoption, and **BSIZE**, **LEV**, **GEA**, **LIQ**, and **HHI** denote bank size, leverage ratio, gearing ratio, liquidity ratio, and market concentration, respectively. Given the panel structure of the data, unobserved heterogeneity across banks and time may exist. The fixed effects model accounts for such heterogeneity by allowing intercepts to vary across banks (1). The suitability of the fixed effects specification is assessed using the Hausman test (Ali & Puah, 2019), where rejection of the null hypothesis supports the use of fixed effects over random effects.

## 4. Results and Discussion

### 4.1. Descriptive Analysis and Correlation Analysis (Revised)

The results of the descriptive analysis are reported in Table 2. With respect to the dependent variables, the findings indicate that bank stability, measured by the Z-score, ranges from 4.03 to 52.64, with a mean value of 14.11. This variation suggests considerable heterogeneity in the stability levels of financial institutions over the study period, reflecting differences in capitalization, profitability, and earnings volatility. The relatively wide dispersion of Z-scores highlights the varying degrees of resilience among banks operating within the Jordanian financial system. Regarding cyber risk, the descriptive statistics reveal a mean value of 0.03, with a minimum of −0.03 and a maximum of 0.12, indicating notable variation in banks' exposure to digital and operational risks associated with FinTech adoption. The presence of negative and positive values suggests differences in cybersecurity preparedness and digital risk management practices across institutions and over time. With respect to the independent variable, the results show that FinTech adoption ranges from 0.00 to 1.00, with a mean value of 0.27. This indicates that, on average, approximately 27% of the sampled banks had adopted mobile banking or digital financial services during the study period, reflecting a gradual but uneven diffusion of FinTech innovations within the Jordanian banking sector. Turning to the control variables, bank size exhibits a mean value of 12.96, ranging from 10.64 to 15.02, indicating substantial variation in the scale of operations across financial institutions. Bank leverage has a mean value of 0.86, with values spanning from 0.01 to 0.96, suggesting differences in capital structures and reliance on liabilities. The gearing ratio records a mean of 8.44, ranging from 0.01 to 27.21, reflecting varying degrees of debt intensity among banks. The liquidity ratio has a mean value of 1.06, with a minimum of 0.02 and a maximum of 12.72, indicating considerable differences in liquidity management practices. Finally, the concentration ratio (HHI) has a mean value of 2485.01, ranging from 1879.50 to 2928.96, suggesting a moderately concentrated banking market structure. This level of concentration may have implications for both financial stability and cyber risk, as dominant institutions often operate extensive digital infrastructures that can amplify both resilience and vulnerability. Overall, the descriptive statistics provide preliminary insights into the structure of the data and underscore the importance of accounting for heterogeneity across banks when examining the relationship between FinTech adoption, bank stability, and cyber risk. Correlation analysis (not reported for brevity) indicates no evidence of severe multicollinearity among the explanatory variables, supporting the suitability of the empirical models employed in subsequent analyses.

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