RESEARCH ARTICLE **Open Access**

FinTech Disruption and Credit Risk: How Digital Finance Shapes Bank Stability in a Growing Economy

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Abstract

This research investigates the determinants of credit risk in the banking sector of Pakistan with a special emphasis on the contribution of financial technology (FinTech). Based on panel data from 14 commercial banks for the period 2013-2023, the analysis includes bank-specific variables and macroeconomic variables, supplemented by a FinTech index. Based on asymmetric information theory, the research investigates the ways in which technological innovation minimizes information asymmetry and remodels credit risk. The findings establish that loan loss provisions sharply raise credit risk, validating their status as symptoms of declining asset quality. Profitability, capitalization, economic expansion, and FinTech penetration have statistically significant impacts in line with theoretical predictions, marking their role in better credit risk management. Bank size, however, proves to be insignificant, indicating Pakistani large-scale institutions are not necessarily more resilient. The results reinforce the significance of provisioning habits and deeper FinTech integration in enhancing banking stability.

Keywords: Credit Risk, FinTech, Bank Capitalization, Economic Growth

1. Introduction

A country's economic stability depends in part on the banking sector, since it collects savings and then lends the money out to those who need it for investment. Banks play a pivotal role in sustaining economic growth and stability by mobilizing savings, channeling funds to investment opportunities, and facilitating both household and business financial activities (Kanga et al., 2022). Nowadays, protecting themselves against credit risk is a vital issue for banks everywhere. If a debtor won't follow the set rules, it is known as credit risk, and it directly affects a bank's well-being and ability to remain secure. Credit risk has become more significant to understand, especially after the global economic crisis and recent economic downturns. The main objective of this study is to find out how credit risk in the banking sector is influenced by the type and size of the bank, bank profits, capitalization, loan loss provisions, economic growth and the adoption of financial technology.

Research on credit risk often focuses on the size of banks. Being big often helps banks by reducing the chance of default on loans. Yet, they may pursue riskier projects since they feel their size will save them under all circumstances. It appears from recent research that big banks can reduce certain risks by holding a wide range of assets, but they are still affected by challenges in credit markets when the economic climate is unstable (Tarawneh et al., 2024) Bank size, performance, loan growth, inadequacy, ownership concentration, and diversification are among the bank-specific variables. Nonetheless, interbank rivalry and concentration are industry-specific issues, whereas GDP growth, inflation, public debt, and unemployment are macroeconomic factors.

Increased banks profitability may act as a safeguard against future loan defaults. A bank's capacity to withstand losses is indicated by its capitalization. Banks with adequate capital are more resilient to credit shocks. Vietnamese commercial banks' empirical data show that capitalization and profitability have

a major impact on credit risk levels (Nguyen, 2023). Whereas**,** LLPs are funds kept aside, in case some loans cannot be repaid. They forecast eventual credit losses before they occur. More loans being advanced as LLPs usually represents a worsening of asset quality. It has been found that when LLPs increase, there is a higher risk of credit, signifying that management anticipates many future defaults (Saiz-Sepúlveda & Hernández-Tamurejo, 2024).

Credit risk is significantly influenced by macroeconomic factors, especially economic development as indicated by GDP. Strong economic expansion usually improves debtors' ability to repay debt, which lowers the likelihood of default. On the other hand, because of higher unemployment and lower income levels, economic downturns can increase credit risk. Studies on the UK banking industry have shown a strong negative correlation between credit risk levels and GDP growth (Hoxha et al., 2025).

Credit risk management has seen both opportunities and challenges since the emergence of fintech, which has completely changed banking operations. Fintech technologies have improved operational efficiency and risk assessment accuracy. Examples of these include blockchain-based lending platforms and AI-driven credit rating. But they also bring with them new risks, like cybersecurity risks and unpredictability in regulations. Fintech's effect on credit risk was highlighted in a study on Pakistani banks, highlighting the necessity of integrating technology into banking procedures in a balanced manner (Cao et al., 2021). In the meantime, inflation, economic expansion, and interest rates are examples of external influences (Priyadi et al., 2021)

There is need to explore FinTech’s long-term impact, regulatory solutions, and differences between developed and emerging markets. AI and big data can also be examined for improving risk assessment in digital banking. This study aims to explore that how these factors affect the performances of the banks and how it mitigates the risks of the banks.

The aim of this research focusses on testing if bank profitability, bank size, and bank capitalization have an impact on credit risk, as well as the degree to which macroeconomic variables like economic growth, as well as institutional variables like fintech adoption and loan loss provisions, can have an impact on the credit risk of banks.

This study is grounded in Asymmetric Information Theory, which explains how credit risk arises due to unequal information between lenders and borrowers. Fintech tools are viewed as mechanisms to reduce this asymmetry. Asymmetric Information Theory, initially introduced by Akerlof (1970), suggests that in financial transactions, one party often has more or better information than the other. In the context of banking, borrowers typically have more knowledge about their repayment ability than lenders do. This imbalance leads to two critical problems. One is adverse selection (high-risk borrowers getting approved unknowingly), and moral hazard (borrowers changing behavior after receiving the loan). Both issues increase a bank's exposure to credit risk, as they weaken the ability of banks to properly assess and price lending risk. According to this theory, the effectiveness of credit risk management depends largely on how well banks can reduce this informational gap. This study integrates this theory by arguing that variables like loan loss provisions (LLP), profitability, and especially fintech play a role in mitigating information asymmetry. Fintech, in particular, has the potential to improve the accuracy of credit assessments, increase data availability, and support automated decision-making through AI and big data analytics. However, in Pakistan's banking sector, empirical evidence on the role of fintech in reducing credit risk remains limited, forming the central research gap of this study.

2. Literature Review

A credit risk describes the possibility that an individual or entity will not repay a loan and the bank will not be able to recover their initial input (Chen et al., 2025). Assessing credit risk is a major obstacle for both local and international banks. A credit risk is the probability that a loan borrower will not be able to repay, causing the institution to gain losses. If banks understand what influences credit risk, they can improve their risk management decisions. In this review, the study considers six key aspects—bank size, profitability, capitalization, economic growth, loan loss provisions, and fintech, and discusses how they are connected to credit risk in Pakistan as well as globally.

Bank Size

The size of a bank is usually measured by taking the logarithm of its total assets **(**Thapa et al., 2025). It represents the size and market clout of the bank. Credit Risk depends on the relationship between debtors and lenders. The connection between a bank's size and credit risk can be difficult to understand. Larger banks may manage risks more effectively by taking advantage of opportunities in capital markets. Specifically, found that in Pakistani banks, the larger the bank, the better it manages its credit risk and reduces non-performing loans (Adolph, 2016). In addition, a global study found that economies of scale, higher governance, and a diverse range of assets helped reduce credit risk for large banks in the U.S. and Europe. Certain researchers think that large institutions can take on extra risks since they are considered too essential to fail, especially regarding credit (Hasannasab et al., 2025)

H_1: Bank size has a significant impact on bank credit risk.

Bank Profitability

Financial metrics such as bank profitability serve as vital indicators of a bank's efficiency in converting its equity and assets into profit (Singh, 2023). These ratios illuminate the financial landscape, revealing how adeptly a bank navigates the

complex waters of profitability. Interestingly, a trend emerges where credit risk often shows an inverse relationship with profitability; banks that excel in their operations tend to have a superior ability to manage risks and absorb potential losses. In the context of Pakistani banks, a compelling connection is evident: a negative correlation between bank profitability and credit risk highlights that the most profitable banks maintain a steadfast commitment to high credit quality (Thapa et al., 2025). This dynamic reflects not just financial acumen but also a strategic approach to risk management, ensuring resilience in a competitive environment.

H_2: Bank profitability has a significant impact on bank credit risk

Bank Capitalization

The capitalization of banks is measured by the Capital Adequacy Ratio (CAR), a key indicator that assesses the proportion of a bank's capital against its assets, adjusted for risk exposure (Ozili, 2025). Strongly capitalized financial institutions stand resilient in the face of economic turbulence and credit crises. Research findings reveal that within the Gulf Cooperation Council (GCC) nations, banks with robust capital reserves have significantly lower rates of non-performing loans (NPLs)(Hakimi, 2025). This compelling evidence suggests that following to the sufficient capital requirements specified by Basel III not only strengthens banks but also substantially reduces the likelihood of defaults. The study underscores the vital role that adequate capitalization plays in maintaining financial stability and fostering trust in the banking sector.

H_3: Bank capitalization has a significant impact on bank credit risk.

Economic Growth

The annual percentage growth rate of Gross Domestic Product (GDP) serves as a vital gauge of a nation's economic vitality. When the economy is thriving, the risk of loan defaults diminishes significantly, as both individual incomes and corporate profitability soar (Ghroubi, 2023). There is a striking negative

correlation between credit risk and GDP growth in Pakistan, suggesting that a stable macroeconomic environment fosters healthier loan portfolios. On a global scale, it is identified a persistent negative relationship between non-performing loans (NPLs) and GDP growth across all OECD countries (Raza, 2025).

H_4: Economic Growth has a significant impact on bank credit risk

Loan Loss Provisions (LLPs)

Banks set aside money known as Loan Loss Provisions (LLPs) to cover anticipated losses from default loan. LLPs are often represented as a percentage of total loans (Lian et al., 2025). Higher LLPs are frequently a sign that bad loan performance is anticipated. In their study of Pakistani banks discovered a high correlation between rising NPLs and LLPs, indicating an increase in credit risk (Akande & Salawu, 2019). There was a positive relationship between higher levels of providing and future losses due to credit in LLPs. LLPs depict adverse pointers to developing credit situations. It is noted that credit risk is the taking conduct of the bank at the moment which is dependent on the proportion of loan loss provisions to gross loan (Zheng, et al.,2019). The better a higher ratio a company has, the greater the risk-taking (more risky loan portfolio). Bigger L-L-P is also an indicator of a lower quality of the loan portfolio (bigger NPLs). The reason is that a high share of NPLs renders it in more credit risk and consequently more credit loss provisions (Saleh & Abu Afifa, 2020)

H_5: Loan loss provision has a significant impact on bank credit risk.

Fintech

Fintech is defined as the use of technology, including blockchain, artificial intelligence, and mobile banking, to provide financial services in novel ways.

Technological advances in the sphere of financial services have resulted in emerge the phenomenon of FinTech or a new paradigm. FinTech can reduce the risk of credit because it increases credit assessment and decreases asymmetry of information (Anestiawati et al., 2025). FinTech refers to a broader horizon of the

financial ecosystem, including innovations of credit markets, payment systems and blockchain-assisted smart contracts (Cao et al., 2021). By enhancing credit evaluations and minimizing information asymmetries, fintech can reduce credit risk. Globally, fintech improves credit screening and lowers default rates. But they also cautioned that relying too much on automated systems can create new operational hazards. Kanga (2022**)** looked into how using ATMs and mobile phones influenced the quality of everyday life. It looks like the impact of FinTech on both GDP per capita and financial inclusion will last more than just the short term. It is proposed that both financial sector progress and wider acceptance of FinTech could be achievable policies.

H_6: Fintech has a significant impact on bank credit risk.

3. Methodology

In order to attain the purpose of the objectives of credit risk in the banking sector of Pakistan, the data has been gathered based on the published report of state Bank of Pakistan that is 2013-2023. The panel data of 14 banks in Pakistan over the period of 2013-2023 is used for this study.

Bank credit risk related constructs to be employed in the paper are listed below in Table 1 with corresponding measurements.

Table 1:

Variables Measurement

VARIABLE	MEASUREMENT	SOURCE
Credit risk	non-performing loans / total loans ratio	Akhter, (2023)
Bank size	Bank Size = Natural Logarithm of Total Assets	Akhter, (2023)
Bank Profitability	NIM= Net interest income/ total assets	Akhter, (2023)
Bank capitalization	Capital Adequacy Ratio = Total Equity / Total Assets	Akhter, (2023)
Economic Growth	GDP Growth rate = % change in GDP	Akhter, (2023)
Loan Loss Provisions	Loan loss provisions divided by the total loan.	Ozili, (2024)
FinTech	Fintech Index	Ally et al., (2025).

Panel Data Analysis

In order to analyze the factors that may affect the credit risk of banks, we will use dynamic panel estimation method. Considering that the dataset, panel data analysis, which is the most appropriate econometric method, is applicable. This is effectively dealing with unobserved heterogeneity among banks and also is able to control the endogeneity problems that many a time go unaddressed in pure cross-sectional or time-series studies. Conventional methods only result in biased and inconsistent estimates, especially when the history of the dependent variable impacts the current one.

To capture these dynamic effects, a lagged dependent variable is included in the model, representing the persistence of credit risk over time. The following econometric model is estimated:

$$CR_{i,t} = \beta_0 + \beta_1 BS_{i,t} + \beta_2 BP_{i,t} + \beta_3 BC_{i,t} + \beta_4 EG_{i,t} + \beta_5 LLP_{i,t} + \beta_6 FT_{i,t} + \beta_7 CR_{i,t-1} + \varepsilon$$

The model is trying to predict the variables that determine the credit risk of banks, and the dependent variable, Credit Risk (CR), is recorded as a rate of Non-Performing Loans to Total Loans (NPLR). In order to examine the effect of profitability on credit risk, two proxies are involved, and Net Interest Margin (NIM). Such indicators are a symbol of the internal profitability of banks and the structure of income.

The Capital Adequacy Ratio (CAR) is provided to study how the capitalization of a bank has an influence on the credit risk because it determines how much losses a bank could absorb, remaining solvent. The natural logarithm of bank size, calculated by total assets, is the measure of bank size (SIZE). The measure is added as the Size of the bank play's role in risk taking behavior.

Besides bank unique variable LLP, Loan Loss Provisions to Total Loans (LLP) is adopted as a proxy of credit risk management practice, a greater proportion could indicate it can be more conservative in its provisioning against risky assets. In case of the external macroeconomic conditions, to test survival of

the impact of economic performance onto the credit risk, GDP Growth Rate (GDP) is involved.

4. Results

The description of the research methodology in the above section has intended to inform the test of the rationale of extension as a motive of issuance of trade credit by manufacturing firms of Pakistan. In this in this respect, this part explains Descriptive Analysis, Pearson Correlation Coefficient, Unit-Root Diagnostic and Panel estimation findings.

Table 2

Descriptive Statistics

Variables	Mean	Maximum	Minimum	Std. Dev.	Observations
CR	7.658	20.711	0.621	4.960	154
BS	0.030	0.093	0.011	0.009	154
BP	0.260	2.698	0.002	0.498	154
BC	20.218	22.618	16.734	1.316	154
EG	3.848	6.573	-1.274	2.433	154
LLP	2.767	14.750	0.011	4.015	154
FTI	-0.001	4.687	-5.198	2.801	154

Note: Here CR = Credit Risk, BS = Bank Size, BP = Bank Profitability, BC = Bank Capitalization, EG = Economic Growth, LLP = Loan Loss Provisions, FTI = FinTech Index

The descriptive statistics indicate that Credit Risk (CR) has a mean of 7.658, but over a wide range of 0.621 to 20.711, indicating substantial variations in exposure to non-performing loans. Bank Size (BS), as reflected by total assets, has a modest mean of 0.030, with restricted variation (Std. Dev. 0.009). Bank Profitability (BP) has a very low average of 0.260, despite some banks doing much better (maximum value of 2.698) than the minimum value of 0.002, depicting heterogeneity in performance. Bank capitalization (BC) is 20.218 on average, ranging between 16.734 and 22.618, meaning moderate variation for different banks. Economic Growth (EG) has a mean of 3.848, ranging from -1.274 to 6.573, indicating phases of contraction and expansion in the economy. Loan Loss

Provisions (LLP) are on average 2.767, although the large spread from 0.011 to 14.750 suggests significant variation in provisioning practices. The FinTech Index (FTI) is a mean value close to zero (-0.001), but with large variability (range -5.198 to 4.687), suggesting uneven uptake across banks.

Correlation Matrix

In Table 3 the results of correlation show the bivariate relationships between credit risk and the independent variables like bank size, bank capitalization, bank profitability, economic growth, loan loss provisions, and fintech.

Table 3

Pearson Correlation

Variables	CR	BS	BP	BC	EG	LLP	FTI
CR	1						
BS	0.154	1					
BP	-0.255	0.112	1				
BC	-0.148	0.123	0.171	1			
EG	0.047	-0.227	-0.11	0.068	1		
LLP	0.211	-0.058	-0.07	0.013	0.286	1	
FTI	-0.191	0.101	0.356	-0.015	-0.323	-0.581	1

Note: Here CR = Credit Risk, BS = Bank Size, BP = Bank Profitability, BC = Bank Capitalization, EG = Economic Growth, LLP = Loan Loss Provisions, FTI = FinTech Index

The findings show that Credit Risk (CR) is influenced by several factors. Bank Size (BS) shows a weak positive correlation with credit risk (r = 0.154), indicating that larger banks engage in more risk-taking actions. Bank Profitability (BP) has a negative correlation with credit risk (r = -0.255), suggesting that more profitable banks face lower credit risk, supporting the theoretical probability that strong financial performance contributes to better credit management. Bank Capitalization (BC) is also negatively correlated with credit risk (r = -0.148), indicating that well-capitalized banks are better equipped to absorb losses and reduce credit exposure. Economic Growth (EG) has a weakly positive correlation with credit risk (r = 0.047), suggesting that economic growth typically reduces

credit risk, though this weak relationship reflects short-term fluctuations or the influence of other factors not captured in a simple correlation. Loan Loss Provisions (LLP) have a positive correlation with credit risk (r = 0.211), indicating that higher loan loss provisions are linked with greater expected credit losses, supporting the idea that provisioning reflects the fundamental risk levels in the loan portfolio. The FinTech Index (FTI), measuring fintech adoption, shows a moderate negative correlation with credit risk (r = -0.191), indicating that the acceptance of financial technology tools may help decrease credit risk, likely through improved screening, monitoring, and automation. Overall, the correlation results support further analysis by panel estimation, particularly to confirm the significant relationships of bank profitability, loan loss provisions, and fintech with credit risk.

Panel Regression Estimation

To identify the determinants of credit risk, a dynamic panel estimation method was applied that controlled for unobserved heterogeneity, endogeneity, and the state dependency of credit risk over time. The model includes a lagged dependent variable in order to identify dynamic impacts, and the Hausman test was used to choose the Fixed Effects specification. The findings are presented in the table below

Table 4

Panel Estimation Results

Variable	Coefficients		
C	37.4622	R-Square	0.8205
BS	0.2688*	Adjusted R-Square	0.7950
BP	1.5189**	Hausman Test	0.001
BC	0.2590	F-Statistics (Prob)	0.000
EG	0.1144*		
LLP	0.4656*		
FTI	0.2762**		

Note: Here CR = Credit Risk, BS = Bank Size, BP = Bank Profitability, BC = Bank Capitalization, EG = Economic Growth, LLP = Loan Loss Provisions, FTI = FinTech Index

The results in Table 4 show the panel regression analysis used to examine the influence of various bank-specific and macroeconomic factors on Credit Risk of banks in Pakistan. Based on the Hausman test, the Fixed Effects model was selected as appropriate.

Bank Size (BS) has a positive coefficient of 0.2688, implying that larger banks might take on more risk, possibly due to confidence in their capital buffers. Empirical research, for instance, by Laeven et al. (2016) and De Haan and Poghosyan (2012), substantiates that bank size is directly related to credit risk since bigger banks take on riskier lending and investment strategies. This phenomenon highlights the significance of regulatory intervention to prevent excessive risk-taking by large financial players. Bank Profitability (BP) has a coefficient of 1.5189, suggesting that an increase in profitability is associated with higher credit risk; this is counterintuitive and may indicate aggressive lending behavior among profitable banks. Higher bank profitability is often associated with increased credit risk due to the pursuit of high-return, high-risk activities, lax lending standards, and overconfidence in financial health. Studies like Naili and Lahrichi (2022) and Le and Ngo, T. (2020) also highlight that profitability can drive banks to take on riskier loans or investments, elevating credit risk exposure. Similarly, Bank Capitalization (BC) has a positive coefficient of 0.2590, suggesting that better-capitalized banks might also engage in riskier activities. However, these relationships for BS and BC were statistically insignificant, indicating their influence is not robust in explaining credit risk in this sample.

Economic Growth (EG) has a positive relationship with Credit Risk (CR) (coefficient 0.1144), contrary to expectations that credit risk decreases during periods of economic expansion. This may reflect short-term macroeconomic instability or lag effects in risk recognition (Nguyen, 2023). This is explained by growth model of Pakistan, which is often debt-financed and coupled with macroeconomic uncertainty, translating to increased defaults on loans and

systemic risk (Abid et al., 2024). The findings show that Loan Loss Provisions (LLP) have a positive and significant influence on Credit Risk (CR). This suggests that banks assigning higher provisions for loan losses tend to face higher credit risk, likely reflecting an increased probability of default within their loan portfolios. These results align with risk management practices where LLP acts as a direct indicator of a bank's credit exposure (Zheng, 2019).

The FinTech Index (FTI) showed a positive relationship with credit risk. Empirical research indicates that rapid digital lending driven by fintech in developing economies is associated with greater non-performing loan (NPL) levels, further supporting the thesis that fintech expansion in the absence of proper regulation increases credit risk. (Anestiawati et al., 2025).

5. **Conclusion**

This study designed to examine the factors influencing the credit risk of banks in Pakistan by using a panel data approach. The Data analysis was based on the secondary data which was collected through commercial banks over a defined time period by using credit risk as the dependent variable, and bank-specific and macroeconomic variables (bank size, bank capitalization, bank profitability, economic growth, loan loss provisions, and fintech) as independent variables.

The panel estimation results were selected based on the significant Hausman test preferred the Fixed Effects Model. Among the explanatory variables, loan loss provision (LLP) was found to be positive and statistically significant, indicating that banks with higher provisioning are more exposed to credit risk. This finding aligns with established financial theory, as LLP reflects expected losses from non-performing loans and is a direct measure of credit exposure.

Additionally, bank capitalization, though traditionally seen as buffers against financial instability, may not appear significant because larger and well-capitalized banks in Pakistan might still engage in high-risk lending practices,

especially under competitive pressure. Similarly, economic growth, expected to reduce credit risk, but showed a positive coefficient, possibly reflecting short-term fluctuations, structural inefficiencies, or a lag between macroeconomic improvements and changes in bank asset quality.

Furthermore, the fintech index, result indicates that the rapid expansion of fintech-led digital lending is associated with increased levels of non-performing loans (NPLs), supporting arguments that in the absence of proper regulation, fintech growth can increase credit risk. These findings underscore the importance of loan loss provisioning as the most reliable predictor of credit risk in the Pakistani banking sector, while also highlighting the need for further exploration of other institutional and technological factors.

Implications

Based on the empirical findings, several policy recommendations can be proposed:

1. Strengthen Risk Management Frameworks: Given the strong relationship between loan loss provisions and credit risk, banks must adopt more conservative and forward-looking provisioning practices. Regulatory authorities like the State Bank of Pakistan should continue enhancing loan classification and provisioning guidelines to reflect actual credit risk.
2. Enhance Credit Monitoring Mechanisms: Banks should improve credit assessment, monitoring, and recovery strategies to minimize the need for high provisioning. Internal credit scoring and early warning systems must be strengthened.
3. Oversee Fintech-Driven Risks: As fintech growth reflected a positive and significant correlation with credit risk, its growth needs to be regulated with utmost care. Policymakers and the State Bank of Pakistan need to emphasize enhanced digital credit screening, borrower validation, and cybersecurity architectures to ensure that fintech adoption lessens, not

increases, systemic exposure.

4. Regulate Bank Size and Capitalization: The findings reveal that large banks play a substantial role in increasing credit risk, but capitalization was insignificant. This implies that larger banks in Pakistan might be taking aggressive lending when under competitive pressure. The regulators need to closely watch the credit behavior of big banks and make sure that capital buffers are actually used to dissipate shocks instead of being used for riskier lending.
5. Address Growth-Led Credit Risk: Economic growth had a positive and significant impact on credit risk, as opposed to traditional assumptions. This indicates that for Pakistan, growth tends to arrive in debt-financed or unsustainable expansions that increase default risks. Growth strategies ought to be accompanied by more robust financial regulation, responsible lending policies, and macroeconomic stability policy to ensure that growth phases do not convert into increased systemic risk.

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