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The Impact of Fintech on Credit Risk of Banks: Evidence From the Tehran Stock Exchange

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Abstract

The Rise of Banking Fintechs and Their Impact on Offering New Financial Services and Innovating Traditional Financial Services, Through a Wide Spectrum of Technological Applications Across All Consumer Product Value Chain Sectors, Challenging the Dominance of Traditional Banks in the Financial Industry. Fintech represents a new financial industry utilizing technology to enhance financial activities. Credit risk, a critical dimension of resource allocation in the financial system, is a primary concern for banks. This study aims to explore the influence of bank fintechs on credit risk. Data was gathered through a questionnaire distributed to heads, deputies, and credit specialists actively engaged in the third quarter of 2023. Statistical analysis of 132 responses reveals that environmental, organizational, financial, and interaction management factors within fintech significantly and inversely affect credit risk. This indicates that fintech development reduces credit risk levels in commercial banks, with fintech applications playing a pivotal role in this reduction.

Keywords: Fintech, Credit Risk, Environmental Factors, Financial Factors, Interaction Management

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Introduction

In the modern economy, the financial services industry plays a critical role in the domestic production of countries. Banks have become inseparable from fintech (financial technology), gradually interacting with it, leading to changes in competition and financial trends, and resulting in a shift of some market share from traditional banks to non-bank institutions. Given these changes, collaboration with fintech, especially for businesses offering fintech-complementary services to banking, appears essential for traditional banks. These developments are driving increased investment in fintech and prompting a reassessment of business models. With flexibility in adopting technology, banks can effectively respond to credit risks. Additionally, the role of credit rating banks in evaluating and controlling credit risks is crucial. It is important to note that financial innovations are reshaping operational models and creating new business opportunities for providers of traditional financial services. Furthermore, fintechs, as providers of innovative financial services, play a significant role in attracting customers and generating profitable margins.

Over the past decade, fintech has risen prominently in global financial markets, with fintech companies experiencing significant growth. The rapid expansion of fintech has drawn considerable academic interest. Many studies have explored and embraced the emergence of fintech, asserting that these nascent technologies have the potential to fundamentally alter financial services by substantially reducing transaction costs (Foster et al., 2019; Chiu & Koop, 2019). The development of fintech has had a remarkable impact on the operations of banks, leading many banking products to become data-centric and potentially sourced from other financial service providers. Furthermore, modern data analytics and information technology have enabled the digital personalization of financial services. Timely integration of fintech into business operations allows banks to gain a competitive edge in an increasingly competitive landscape. Fintech emerged as a widely-used specialized term in 2015, unexpectedly engaging financial businesses in this trend. Many financial institutions are actively seeking to comprehend the technological impact on expanding the supply and demand for financial products and services. Mobile technology, more than ever before, has streamlined the management of startup businesses and laid the groundwork for the rise of the fintech era (Aftkhari Sinjani et al., 2021). Drawing from the Technology Acceptance Theory initially proposed by Davis in 1989 for research in social psychology, a model has been derived to examine the relationship between variables related to risk reduction, profitability, and the intention to adopt technology. The Theory of Reasoned Action and the Theory of Planned Behavior are foundational theories in social psychology that underpin the Technology Acceptance Theory. The Theory of Reasoned Action posits that an individual's behavior is influenced by their intention to perform a specific action. In this study, we begin by defining credit risk, which arises from the potential loss of principal or financial gains due to the borrower's failure to repay a loan or meet contractual obligations. This phenomenon is referred to as credit risk. Credit risk emerges when borrowers anticipate using future cash flows to settle current debts. Investors require an appropriate return for assuming credit risk, typically in the form of additional interest payments from borrowers or debt

issuers. This type of risk is closely tied to the profit potential of an investment. For instance, the predicted level of credit risk significantly impacts the interest rates that investors will demand for lending their capital. Consequently, this study aims to explore the effects of banking fintech on credit risk.

The emergence of fintech banks and their application in offering new financial services, as well as innovating traditional financial services through a wide spectrum of technological applications across all sectors of consumer product value chains, has challenged the dominance of traditional banks in the financial industry. Fintech banks represent a new financial industry utilizing technology to enhance financial activities. Given the inevitable progression of financial technologies on one hand, and the challenges they face on the other hand, it is crucial to align supervisory systems with dynamic regulations to ensure they support innovative service quality and prevent disruptions to the advancement of fintech. Considering the significant role of fintech in the economy and its role as competitors to traditional banks, it is imperative for the sector to examine how banks interact with fintech.

2. Theoretical framework

The term "financial technology" (fintech) is used to describe the adoption of new technologies that enhance the performance of financial services. Fintech can help various stakeholders manage and control their financial operations through a variety of tools, devices, and software. Islamic banking, as a financial service provider, must be able to respond to challenges and create a competitive advantage by developing innovative financial products and services using fintech, staying current with technological advancements (Siska, 2022). Khan et al. (2017) explored the relationship between financing liquidity and bank risk-taking, showing that the size of banks and their capital usually limit their ability to take on more credit risk. Additionally, risk-based capital plays a crucial role in capital adequacy requirements. Overall, existing studies primarily focus on the determinants of bank credit risk, including macroeconomic factors, market characteristics, and bank-specific attributes.

Fintech is a term used to describe financial technology, which includes any technology in financial services used by both businesses and consumers. It refers to companies that offer financial services through software or other technologies, encompassing everything from mobile payment apps to cryptocurrencies. Some financial technology experts believe that fintech related to banking has moved banking from physical locations to the digital space. Successful examples of banking fintech in Iran include the GardeshPay app (Tourism Bank), the AP app, and various mobile banking apps provided by both state-owned and private banks. Insurance-related fintechs aim to fully digitize the processes for insuring individuals, vehicles, homes, and other assets. Investment-related fintechs assist users in managing their transactions via smartphones or web-based tools, allowing them to track and record payments, receipts, and trades. The benefits of fintech include saving money and time, providing flexibility, and ensuring transparency. Factors affecting the interaction between banks and financial technology include stakeholder characteristics, environmental factors, organizational factors, financial factors, interaction management factors, and support factors (Najafi et al., 2020).

A crucial necessity for sustainable credit risk management is the ability to

accurately and efficiently monitor customer credit lines. Credit management does not end until the loan is fully repaid and the last installment is recovered. Consequently, as financial conditions evolve, the bank's credit approach may also need to adapt (Ahmed and Malik, 2015). Banks, as a fundamental part of the financial system, play a vital role in financing various economic sectors. In performing this role, banks encounter different types of risks, with credit risk being one of the most significant. Credit risk reflects the potential situation where a borrower may fail to repay their debts and financial obligations (Leo et al., 2019). The goal of credit risk management is to maximize the return on loans while maintaining an acceptable level of risk (Jandaghi et al., 2020).

Fintech has transformed financial management by digitizing services, introducing a revolution in how financial activities are conducted. These technologies span multiple domains, including digital banking (e.g., mobile banking apps like GardeshPay), online lending (platforms such as IranRenter and VamYar), digital insurance (services like Bimito and BimeBazar), investment management, and electronic payments (cryptocurrencies, payment gateways, and e-wallets). These tools simplify and accelerate financial processes, making them more efficient and accessible without requiring physical presence. Notable Iranian innovations in this sector have significantly enhanced user experience while minimizing the need for in-person interactions, (Kashian et al., 2022).

The interaction between banks and fintech is influenced by six key factors. Stakeholder characteristics, including their identification and management, are vital for fostering effective collaboration. Environmental factors such as economic conditions, legal regulations, and market competition present both opportunities and challenges. Organizational aspects, including structure, culture, and systemic banking risks, strongly affect the adoption of new technologies. Financial resources are equally important, as both banks and fintech companies require sufficient capital for development. Innovations like open banking further facilitate collaboration, while support systems, such as mobile payment platforms, play a critical role in driving the growth and success of these interactions, (Najafi et al., 2020).

Some researchers argue that the macroeconomic environment significantly impacts bank risk. For example, Rajan (1994) proposed a low-frequency business cycle theory to explain changes in credit risk. Borio and Zhu (2012) contend that a prolonged loose monetary policy increases bank credit risk. Furthermore, Louzis et al. (2012) found that the same macroeconomic environment has varying effects on credit risks for different types of loans. Monetary expansion and positive productivity shocks also increase bank leverage and credit risk. Ultimately, a country's credit rating and management quality significantly influence bank credit risk. Boyd and De Nicolo (2005) show that banks might increase their risk-taking behaviors in less competitive markets. However, if banks can adjust their loan portfolios, the impact of market competition on banks is reversed. Additionally, Martinez-Miera and Repullo (2010) argue that there is a U-shaped relationship between competition and banking risk, observed only in the loan market. Banks have fewer incentives to take risks in more collusive markets, and market attitudes are a major factor influencing risk during financial reform periods (Cheng and Qiu, 2020).

3. Background review

- Rahimi et al. (2023) conducted a study on the "Implementation of Fintech Technologies and Systemic Risks in the Banking Network." Several indicators are used to measure this risk, including conditional value at risk, advanced models, ultimate expected shortfall, systemic expected shortfall, systemic risk, and epidemic models. The findings indicate a high level of systemic risk in Iran. Furthermore, the research shows that this risk is higher in state-owned banks compared to private banks. It is important to note that internal company variables, external company variables, and the diversification of bank revenues and assets (bank portfolio management) all have a significant impact on systemic risk.
- Safari et al. (2023) conducted a study titled "Analysis and Examination of the Impact of Financial Technology on the Profitability of Iranian Government and Private Banks." Using the generalized method of moments (GMM) approach, this research investigated the effects of the emergence of new financial technologies in banks. Specifically, it examined customer adoption of services from new-generation mobile banking applications (neobanks), the timing of launching open banking projects in banks, and the ratio of accumulated profits to income, as well as the volume of non-current loans on profitability indicators such as pre-tax return on equity and pre-tax return on assets. The study conducted a comparative analysis between government and private banks on how these factors influence profitability. The results indicate that changes in the ratio of accumulated profits (losses) to total assets, changes in customer adoption of services from new-generation mobile banking applications, and the timing of banks' initiation of open banking platforms have a positive impact on the profitability index of both government and private banks. Conversely, the ratio of non-current loans had a negative impact on this index.
- Khozaei and colleagues (2022) conducted a study titled "Modeling Acceptance of Innovative Financial Technologies." Their research aimed to propose a model for the acceptance of new financial and banking technologies. The results of structural equation modeling (SEM) showed that independent variables such as awareness, perceived security, efficiency, ease of use, and relative advantage have a positive impact on attitudes toward fintech products and services, while cost has a negative effect. Age plays a positive moderating role in the relationship between independent variables and attitudes toward fintech products and services, whereas experience does not moderate this relationship. Thus, attitude serves as a mediator in the relationship between independent and dependent variables.
- Zhang and colleagues (2023) conducted a study titled "The Impact of Fintech Development by Commercial Banks on Credit Risk." This article examines the relationship between fintech development indices by commercial banks and credit risk. The results indicate that fintech development significantly reduces the level of credit risk in commercial banks. Fintech applications play a crucial role in controlling digital risks, thereby reducing credit risk in commercial banks. Moreover, fintech development has a notable impact on small and medium-sized banks. Larger banks exhibit greater inhibitory effects on credit risk.
- Shah and colleagues (2023) conducted a study titled "The Role of Fintech in Credit Risk Management: Analysis of Islamic Banks in Indonesia, Malaysia, UAE, and Pakistan." The aim of this

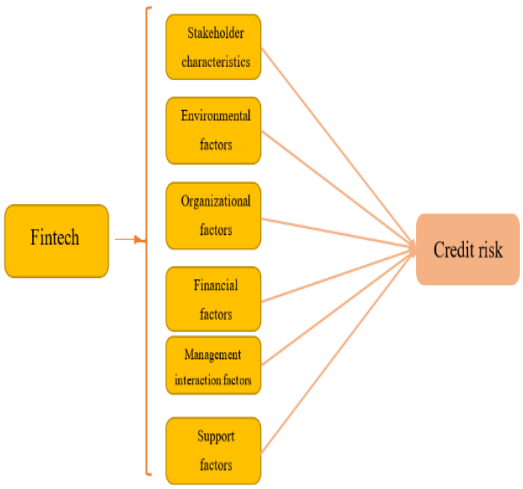
research is to examine the impact of fintech on credit risks before and after financial provision in Islamic banks. The study shows that awareness and acceptance of fintech vary across Islamic countries. The Asia-Pacific region is significantly ahead of the other two regions, with Indonesia leading in fintech awareness and acceptance, and Malaysia leading in leveraging its benefits in credit risk management.

- Almasiah and Islami (2023) conducted a study on the "Impact of Financial Technology (Fintech) on Financial Performance." This study aimed to examine the effects of financial technology, including capital loans, digital payment services, and financial monitoring services, on financial performance in the city of Gorontalo. The results indicated that financial technology in the form of capital loans had an impact on financial performance. Digital payment services also affected financial performance, as did financial monitoring services.
- Zhao and colleagues (2022) conducted a study on "Fintech Innovation and Bank Performance." This study examines the impact of financial technology innovation on the performance of Chinese banks using patent registration data and the Fintech development index. They used a generalized method of moments approach to mitigate potential endogeneity issues. The results show that Fintech innovation generally reduces profitability and asset quality for banks, especially noticeable in large state-owned commercial banks. However, it enhances capital adequacy and improves the efficiency of bank management, albeit to a lesser extent for policy banks and government-owned banks.
- Li et al. (2022) conducted a study titled "Does Bank Fintech Innovation Reduce Its Risk-Taking? Evidence from China's Banking Industry." This research examines the impact and mechanisms of a bank's fintech innovation on its risk-taking behavior. The empirical results indicate that enhancing a bank's fintech innovation significantly reduces its risk-taking. Mechanism analysis reveals that banks leverage fintech innovation to optimize operational performance, improve risk control capabilities, and reduce risk-taking by increasing operating income and capital adequacy ratios. Furthermore, heterogeneity analysis highlights that the impact of fintech innovation on reducing risk-taking is more pronounced in larger, state-owned, joint-stock, and highly competitive commercial banks.
- Tan et al. (2022) explored the topic "Fintech Development and Corporate Credit Risk: Evidence from an Emerging Market." This study analyzes the effect of fintech development on the credit risk of non-financial corporations. Findings show that non-financial firms in cities with better fintech services have lower credit risk. Two identified channels include reducing financial constraints and facilitating the financialization of asset allocation by firms. Ultimately, the role of fintech development in lowering corporate credit risk is particularly evident for non-state-owned firms, small- and medium-sized enterprises (SMEs), and firms in regions with lower levels of marketization.

The conceptual model of the research

The conceptual model of the research based on Zhang et al., 2023, is illustrated in Figure 1.

Figure 1: The conceptual model of the research



Research hypotheses

In this study, based on Zhang et al. (2023), the hypotheses are formulated as follows:

H1: Main Hypothesis: Fintech affects the credit risk of banks.

Subsidiary Hypotheses:

H.1a: Stakeholder characteristics influence the credit risk of banks.
H.1b: Environmental factors affect the credit risk of banks.
H.1c: Organizational factors impact the credit risk of banks.
H.1d: Financial factors influence the credit risk of banks.
H.1.e: Management interaction factors affect the credit risk of banks.
H.1.f: Support factors impact the credit risk of banks.
These hypotheses will be tested using a regression model based on Zhang et al. (2023).

$$CR = \alpha_1 + \alpha_2 CHB + \alpha_3 ENF + \alpha_4 ORF + \alpha_5 FIF + \alpha_6 INF + \alpha_7 SUF + \varepsilon \quad (1)$$

- CR - Credit Risk
- CHB - Stakeholder Characteristics
- ENF - Environmental Factors
- ORF - Organizational Factors
- FIF - Financial Factors
- INF - Management Interaction Factors
- SUF - Support Factors

Research Variables

Dependent Variable:

Credit Risk (CR): It consists of a standard questionnaire on credit risk in electronic banking, composed of 23 questions. The questionnaire items are designed on a five-point Likert scale (from very low to very high).

Reliability and Validity of the Questionnaire

Reliability: The Cronbach's alpha for this questionnaire is 0.758, indicating good reliability.
Validity: The questionnaire has been confirmed for validity through face and content validity, as well as expert opinions.

Independent Variable:

Fintech: It consists of a standard questionnaire on factors influencing interactions between banks and innovative financial technologies, composed of 51 questions. The questionnaire includes four main factors: stakeholder characteristics, environmental factors, organizational factors, financial factors, management interaction factors, and support factors (Najafi et al., 2020).

Table1: Breakdown of Fintech Questionnaire Items by Each Subsidiary Hypothesis

Factors	questions
Stakeholder Characteristics	1-11
Environmental Factors	12-21

Organizational Factors	22-34
Financial Factors	35-41
Management Interaction Factors	41-45
Support Factors	46-51

Research Methodology

The primary objective of this research is to examine the relationship between Fintech and credit risk in the Tehran Stock Exchange. The study's statistical population includes bank presidents, vice presidents, and heads of credit departments in securities banks. This research is of an applied nature and employs a quantitative approach in its methodology. The goal of applied research is to advance practical knowledge in a specific area, aiming to bridge scientific knowledge with practical application. For the theoretical foundation, the study utilizes a literature review method (articles, online texts, books, etc.) and collects necessary data through questionnaires. The thematic scope of this research centers on investigating the impact of Fintech on credit risk in financial accounting. The temporal scope of the study covers the third quarter of 2023, and the geographical scope focuses on banks within the Tehran Stock Exchange.

Population and Sample of the Research

The population of this study comprises bank presidents, vice presidents, and heads of credit departments in securities banks within the Tehran Stock Exchange during the third quarter of 2023. The population specifically includes banks listed on the Tehran Stock Exchange. For this research, a simple random sampling method was used because there was a significant likelihood that the distribution pattern of population characteristics would be reflected in the sample units. This sampling method minimizes bias and maximizes generalizability. Specifically, 18 banks were selected using simple random sampling. Questionnaires were distributed at the central offices of these selected banks. According to the statistics, a total of 200 individuals, including presidents, vice presidents, and credit department professionals, were actively working at the central offices of the selected banks during the research period. Next, the sample size of the study was estimated using Cochran's population sample size formula as follows:

$$n = \frac{Nt^2S^2}{Nd^2 + t^2S^2} = \frac{Nt^2p.q}{Nd^2 + t^2p.q} \quad (2)$$

Sample Size Calculation Based on Simple Random Sampling Using Cochran's Formula estimated 132 questionnaires. Consequently, 140 questionnaires were distributed, and ultimately, 132 questionnaires were used for final analysis.

Data Analysis Methodology

For this study, information sources are categorized into two groups: the first group includes research literature and its background, sourced from library materials, domestic and international journals, databases, articles, and theses. The second group includes data collection sources obtained from the Tehran Stock Exchange website, its comprehensive information system, and the Rahavard Novin financial information software.

During this phase, the independent variable Fintech and the dependent variable Credit Risk were gathered using questionnaire tools. Field research methods were applied for hypothesis testing and addressing research questions, utilizing the questionnaire as the primary research instrument. After computing

descriptive statistics of the research variables, the relationships between variables were examined for causality and structure validation through regression and correlation analyses using SPSS software.

Descriptive Statistics of Research Variables

This section involves analyzing and summarizing the data collected from the questionnaire. The table below provides a summary of the research variables and their roles in the models.

Table 2: Summary of Research Variables and Their Roles in the Models

variable	symbol	The role in the model
Credit Risk	CR	Dependent
Stakeholder Characteristics	CHB	independent
Environmental Factors	ENF	independent
Organizational Factors	ORF	independent
Financial Factors	FIF	independent
Management Interaction Factors	INF	independent
Support Factors	SUF	independent

Summary of Descriptive Statistics for Model Variables is presented in Table 2

Table 3: Descriptive Statistics and Normality Test for Research Variables

	Main	Median	Maximum	Minimum	Standard Division	Skewness	Kurtosis
CR	72.985	74	103	29	14.0218	-0.417	0.096
CHB	45.121	45	55	26	6.6666	-0.456	-0.017
ENF	34.083	34	50	15	5.7758	-0.339	0.721
ORF	40.402	41	54	18	6.7923	-0.512	0.423
FIF	18.114	18	30	7	5.1625	0.029	-0.556
INF	16.871	17	25	5	3.9778	-0.39	-0.085
SUF	23.735	24	30	13	3.9672	-0.173	-0.441

Considering Table 3, the average Credit Risk (CR) is 72.985. The negative skewness coefficient indicates a left-skewed normal distribution, suggesting the curve leans towards the left side of a standard normal distribution. Skewness is referred to as the prominence or flatness parameter of the frequency curve relative to the standard normal curve. A skewness close to zero signifies a balanced and normal frequency curve, positive skewness indicates a prominent curve, and negative skewness indicates a broader curve.

Analytical data interpretation:

Analysis of variable nature and test assumptions

This research utilized correlation based on post-event observations and regression analysis to predict the dependent variable through a series of questionnaire-measured variables. In other words, the study aimed to investigate the impact of fintech on bank credit risk. Therefore, regression analysis was employed to examine conceptual models. To employ regression analysis, several foundational assumptions must be justified: normal distribution, linearity between explanatory and dependent variables, independence of model residuals, absence of severe multicollinearity among independent variables, and normality of model residuals, all of which are discussed further in the results of the foundational assumptions test.

Testing the distribution of study variables

To test the distribution of the study variables, the Kolmogorov-Smirnov test was employed. According to the results in Table 4, the significance level of the normality test for the research variables exceeds 0.05, supporting their normal distribution.

Table 4: Results of the Kolmogorov-Smirnov test for research variables

variable	z-statistic	Sig	result
CR	0.056	.200	Normal
CHB	0.076	.058	Normal
ENF	0.071	.097	Normal
ORF	0.104	.071	Normal
FIF	0.098	.063	Normal
INF	0.097	.054	Normal
SUF	0.101	.072	Normal

Examining the independence of errors between actual and predicted values: Model residuals should be independent of each other, without any interdependencies. To test the independence of model errors, the Durbin-Watson test was employed. If the statistic falls between 1.50 and 2.50, the model is considered to be free from autocorrelation. The Durbin-Watson statistic for the model under scrutiny falls within the expected range, supporting the absence of autocorrelation among the examined models. The results of the residuals' distribution are shown in Table 5.

Table 5: Independence of Model Residuals

Model	Durbin-Watson test	
	Calculated value	Expected value
The first model	1.944	2.5-1.5

Absence of severe multicollinearity among independent variables: As observed in Table 5, the variance inflation factor (VIF) values for the variables are greater than 1 and less than 4, and the tolerance values for the independent variables are greater than 0.3. This indicates that there is no multicollinearity among the independent variables, allowing them to be included simultaneously in a regression model.

Table 6: Results for Multicollinearity Examination

Independent variables	the variance inflation factor (VIF)	the variance Tolerance
CHB	3.771	0.148
ENF	2.855	0.250
ORF	2.342	0.2327
FIF	3.039	0.229
INF	2.490	0.202
SUF	3.678	0.176

Examination of Correlation among Variables:
Table 7 presents the correlation coefficients for analyzing the relationships between the research variables in pairs. The main diagonal of this matrix contains the value one, indicating that each variable has a perfect correlation with itself. All coefficients are significant at the 99% confidence level (the p-value is less than 1%). The larger the correlation coefficient, the stronger and more intense the relationship between the two variables.

Table 7 - Correlation Coefficients

	CR	CHB	ENF	ORF	FIF	INF	SUF
CR	1						
CHB	.679**	1					
	0.000						
ENF	.644**	.777**	1				
	0.000	0.000					
ORF	.864**	.645**	.640**	1			
	0.000	0.000	0.000				
FIF	.912**	.593**	.595**	.669**	1		
	0.000	0.000	0.000	0.000			
INF	.861**	.550**	.486**	.610**	.753**	1	
	0.000	0.000	0.000	0.000	0.000		
SUF	.687**	.901**	.716**	.622**	.619**	.553**	1
	0.000	0.000	0.000	0.000	0.000	0.000	

**. Correlation is significant at the 0.01 level (2-tailed).

Examination of Research Hypotheses
The results of multiple regression analyses are presented in Tables 7 and 8.

Table 7: Multiple Regression Results

model	variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Sig	R	R^2	R^2adj
The first model	Regression	25412.645	6	4235.441	1542.067	.000[b]	0.933	0.927	0.926
	error	343.325	125	2.747					
	total	25755.970	131	-					

a. Dependent Variable: CR

b. Predictors: (Constant), SUF, INF, ORF, ENF, FIF, CHB

In this hypothesis, the effect of independent variables including stakeholders' characteristics, environmental factors, organizational factors, financial factors, management interaction factors, and support factors on the dependent variable of credit risk has been examined. The F-test statistic for the model, with a value of 1542.067, exceeds the critical value, and its computed significance level is less than 0.05, indicating support for the presence of a linear relationship between the independent variables and the dependent variable. The coefficient of determination indicates that approximately 93% of the variation in the dependent variable is explained by the independent variables.

Table 8 - Multiple Regression Coefficients Results

variables	Non-standardized Coefficients		standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant value	0.750	1.083	-	0.692	0.490
CHB	0.011	0.057	0.005	0.194	0.847
ENF	-0.082	0.042	-0.034	-2.930	0.046
ORF	-0.828	0.033	-0.401	-25.371	0.000
FIF	-1.122	0.049	-0.413	-22.958	0.000
INF	-1.054	0.057	-0.299	-18.343	0.000
SUF	0.126	0.087	0.036	1.443	0.151

Dependent Variable: CR

Based on the results from Table 8, the overall findings of the research are summarized in Table 9.

Table 9 - Summary of Hypotheses Results

analysis of relationships between variables		coefficient	Significance level	result
H.1.a	Stakeholder characteristics influence the credit risk of banks.	0.194	0.847	rejected
H.1.b	Environmental factors affect the credit risk of banks.	-2.930	0.046	accepted
H.1.c	Organizational factors impact the credit risk of banks.	-25.371	0.000	accepted
H.1.d	Financial factors influence the credit risk of banks.	-22.958	0.000	accepted
H.1.e	Management interaction factors affect the credit risk of banks.	-18.343	0.000	accepted
H.1.f	Support factors impact the credit risk of banks.	1.443	0.151	rejected
H1	Fintech Affects the Credit Risk of Banks	accepted		

Based on the confirmation of hypotheses one through six, we conclude that the main hypothesis is supported; thus, fintech has a significant and inverse effect on credit risk in banks. Therefore, the primary hypothesis of the research is validated.

Analysis of findings

The examination of research questions and comparison with other studies has shown that the findings of this research regarding the first subsidiary hypothesis (that stakeholder characteristics do not affect credit risk in banks) indicate that stakeholders' strategic decisions sometimes have a more significant impact than those of senior bank managers in achieving goals. It is crucial to strike a balance between stakeholders' desires and their influence on the realization of bank objectives. The primary goal of interaction is to garner and maintain stakeholder cooperation for achieving beneficial outcomes and operational performance for the bank. This study did not find conclusive evidence that stakeholders' characteristics play a role in financial innovations affecting credit risk in banks. Regarding the second subsidiary hypothesis (that environmental factors affect credit risk in banks), the absence of a similar study to establish a theoretical framework made it challenging to directly compare the results with other studies. The findings obtained can only serve as a foundation for future research endeavors in this area. Technology is rapidly evolving, significantly changing the speed and accessibility of financial services. For example, widespread affordable internet and mobile penetration, regulatory movements towards instant payments, loans, and commercial transactions are all driving this transformation. Therefore, it is anticipated that in the short term, highly precise financial products such as credit cards, loans, and payments will undergo the most significant technological advancements. Subsequently, bank accounts and mortgage loans, which typically generate over 50% of income for many banks, will also experience transformation, underscoring the heightened importance of banks' collaborations with fintech companies more than ever before.

The analysis of research questions and comparison with other studies has shown that the findings of this research regarding the third subsidiary hypothesis (organizational factors influencing credit risk in banks) demonstrate several

strategic options for establishing and managing relationships between banks and financial technologies. Key options include focusing on single or combined strategies such as partnering with fintech firms, outsourcing services through technology companies, or investing in and providing necessary capital to fintech startups or incubators. However, the choice between building, partnering with, or acquiring financial technologies depends on the specific conditions and characteristics of financial institutions and fintech companies, as well as the perspectives of their boards and management. Regarding the fourth subsidiary hypothesis (financial factors affecting credit risk in banks), banks have become more actively engaged in collaborations with fintech firms, considering it a cost-effective option with relatively lower risk compared to acquiring or developing fintech service providers or establishing new fintech companies internally. Experts emphasize that traditional banks should prioritize long-term digitalization efforts. Therefore, it can be concluded that traditional banks and fintech service providers can simultaneously act as competitors and partners, with collaboration and interaction being pivotal for banks. Today, banks and fintech service providers have forged a new ecosystem in the business realm where companies co-evolve their capabilities through innovative advancements. Collaboration between banks and fintech service providers is fundamental for succeeding in the digitally transformed world of tomorrow. It is anticipated that banks' weaknesses and fintech service providers' strengths will present substantial opportunities for collaboration.

The examination of research questions and comparison with other studies has shown that the findings of this research regarding the fifth subsidiary hypothesis (that management interaction factors affect credit risk in banks) indicate that fintech is a key driver of continuous development for banks, with significant spillover effects on the banking industry. The advancement of financial technology can alleviate information asymmetry issues for commercial banks, improve the availability and accuracy of information during lending, enhance channels and informational resources, and reduce friction between banks and borrowers. However, the use of fintech by banks may also potentially increase their risk exposure, mainly due to technical and internal management risks. The complexity introduced in financial relationships has intensified interactions among various types of risks within the banking system.

Upon analyzing the research questions and comparing them with other studies, it becomes evident that the findings of this study regarding the sixth subsidiary hypothesis (that support factors for credit risk do not affect banks) indicate fintech as a pivotal driver in the ongoing development of banks, exerting significant spillover effects on the banking sector. The evolution of financial technology can mitigate information asymmetry issues for commercial banks, enhance the availability and accuracy of information during lending, expand channels and informational resources, and reduce friction between banks and borrowers. However, the integration of fintech by banks may also potentially increase their risk exposure, mainly due to technical and internal management risks. The complexity introduced into financial relationships has intensified interactions among various types of risks within the banking system.

Iran has one of the highest rates of penetration in banking services, boasting a swift money transfer system, a dense

network of bank branches per capita, and a high volume of transactions, indicating the robustness of its banking system. Moreover, the country's abundance of university graduates in financial and software fields, coupled with affordable skilled labor, places Iran in a strategic position regionally. However, despite these strengths, limited awareness among economic stakeholders about the industry's capabilities and potential, vague regulations governing fintech activities across all sectors, and the mismatch between these regulations and the development of financial technologies pose challenges. Additionally, technical, legal, and banking infrastructure deficiencies and inadequate security measures for operators have created substantial barriers hindering the industry's full development and potential growth. Despite these challenges, banks have shown little interest in engaging with fintech service providers, preferring to maintain control over both production and distribution of banking services through their established communication channels and platforms. Concerns such as customer data security and fee structures imposed by fintech firms have further deterred collaboration, thereby slowing down innovation and service expansion in the financial sector. These factors may potentially limit their competitiveness in the future.

The analysis of the results and the examination of the research questions, in comparison to other studies, revealed that the findings of this research regarding the main hypothesis (Fintech affects the credit risk of banks) are consistent with the results obtained by Zhang et al. (2023). Various studies worldwide have been conducted within the framework of banking crises. These studies indicate that the primary reason for bank failures is the poor quality of assets. Laria et al. (2016) demonstrated that, since the income derived from bank assets is a significant part of a bank's net income, poor loans or low-quality assets negatively impact bank profitability. Stewart (2005) states that the ratio of non-performing loans in the commercial banking sector worldwide was very high during the periods of 1999 and 2009. According to Stewart (2005), reasons for this increase in non-performing loan ratios include irregular or inadequate credit guarantees, inefficient credit risk management, and excessive interventions in the lending process. The rise of these factors negatively affects bank profitability. Therefore, given the importance of loans in the banking sector and their serious economic implications, revealing the relationship between credit risk and bank profitability is highly significant (Akinci and Poyraz, 2019).

Conclusions and Practical Recommendations

In this section, the conclusions of the results will first be presented, and then the practical recommendations will be discussed.

This research examined the impact of fintech on the credit risk of banks listed on the Tehran Stock Exchange. The findings revealed a significant inverse relationship, indicating that increased use of financial technology reduces credit risk.

Today, banks encounter challenges such as evolving customer expectations, technological progress, regulatory demands, and economic crises, prompting transformations in the banking sector. To navigate these changes, banks should capitalize on the growth of fintech companies and startups. Recent advancements in information technology have spurred rapid innovation in the fintech sector. In response, traditional banks, often hindered by inertia, are adapting to fintech by employing various strategies, with strategic partnerships

being a key approach to mitigate potential threats.

Practical Recommendations

Main Hypothesis: Fintech Affects the Credit Risk of Banks

•Based on the obtained results, it is recommended that managers engage experienced consultants. Experienced consultants provide a clear and vibrant perspective for the system. However, it is important that the responsibility for the project lies with the design team, not the consultants.

•It is suggested that banks' lending activities be aligned with the economic growth rate, inflation increase, and liquidity growth. Given that a high volume of loan defaults causes serious problems for the financial sector, excessive tightening of the banking network in such situations deepens the recession and leads to the spread of the financial crisis from the financial sector to the real economy. Attention to the capital market and financing from this sector is also effective in reducing risk. Improving the capital market and financing from this sector will enhance the real economy and effectively reduce credit risk.

Second Sub-Hypothesis: Environmental Factors Affect the Credit Risk of Banks

•It is recommended that banks improve and enhance their technical and communication infrastructures to utilize social networks and new applications. By offering innovative mobile banking services, they can develop and improve their relationships with fintech companies in areas such as crowdfunding, personal loans, international money transfers, and personal accounting.

•It is suggested that the Central Bank and other regulatory bodies, such as the Shaparak Electronic Payment Network, facilitate and develop the relationship between banks and fintech companies by drafting clear and comprehensive regulations. This, in turn, will foster economic growth, create employment opportunities, and reduce unemployment.

Third Sub-Hypothesis: Organizational Factors Affect the Credit Risk of Banks

•It is recommended that managers and decision-makers in the stock exchange establish regulations for banks to prepare the necessary infrastructure for implementing modern financial methods.

•Banks should move towards a collaborative and participatory culture. By fostering empathy and cooperation, accepting innovation, risk-taking, strengthening team spirit, and embracing improved methods of doing business, banks can facilitate their relationship with fintech companies.

Fourth Sub-Hypothesis: Financial Factors Affect the Credit Risk of Banks

•It is recommended that banks develop and enhance relationships with fintech companies by offering virtual banking services and smart tools, such as smartphones. By reducing the number of branches and employees and transitioning towards branchless banking, banks can lower costs and increase revenue. Additionally, they can enhance customer satisfaction and well-being by providing virtual banking services.

Fifth Sub-Hypothesis: Interaction Management Factors Affect the Credit Risk of Banks

•It is recommended that fintech service providers leverage their agility and innovation to meet the new needs of bank customers. By continuously offering new services within the virtual banking framework, they can increase banks' willingness and enthusiasm for collaboration, thereby attracting banks and improving their own performance.

Furthermore, it is suggested that fintech companies develop their interactions with banks to gain access to the customer databases maintained by the banks. By offering fast and user-friendly services, they can earn the trust of banking network customers, thereby enhancing their reputation and increasing their income.

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