

Does financial expansion breed financial risks?

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Abstract. The rapid expansion of China's financial industry has brought about significant concerns regarding financial risks. This paper empirically analyzes the relationship between financial expansion and financial risks using panel data from 30 provinces in China (excluding Tibet) from 2006 to 2019. Heterogeneity analysis is conducted at the regional level, and reasonable and the model of moderating effects is constructed to examine the pathways through which financial expansion affects financial risks. The results indicate a significant "inverted U-shaped" relationship between financial expansion and financial risks. Further analysis reveals that factors such as the development level of factor markets, real estate investment, financial decentralization, and financial regulation have promoting or inhibiting effects on this relationship. Moreover, the impact of financial expansion on financial risks is more pronounced in the eastern regions or economically underdeveloped areas.

Keywords: Financial Expansion, Financial Risks, "Inverted U-Shaped" Relationship, Moderating Effects

1. Introduction

Financial risk is a highly concerning issue in the development of China's financial industry. The increase in the non-performing loan ratio of commercial banks is one of the leading factors contributing to the rise in financial risks. Due to the significant scale of non-performing loans in China's banking sector, commercial banks face high credit risks. The accumulation of non-performing assets not only adversely affects the profitability and solvency of commercial banks themselves, exacerbating their credit risks, but also leads to a decrease in the efficiency of financial resource allocation, which is detrimental to the safe and stable development of the financial system, thus impacting the real economy[1].

Since 2005, China's financial industry has experienced rapid growth, and the problem of excessive expansion has emerged. The extensive expansion of the financial industry has deviated from the transformation of the real economy and its inherent demand for sustainable development[2]. There has been an excessive increase in the stock of social financing. Local governments intervene in financial activities and participate in financing through various channels, resulting in a continuous increase in local government debt, which can transmit debt risks to the financial system[3].

Based on the fact of excessive expansion in China's financial industry and the high non-performing loan ratio, this paper employs a logarithmic linear model to empirically analyze the impact of excessive expansion in China's financial industry on financial risks. Currently, research on the factors influencing the non-performing loan ratio of commercial banks mainly focuses on economic levels, government intervention, credit environment, and other factors, often overlooking the important fact of excessive expansion in China's financial industry. Therefore, this paper adopts the proportion of value added by the financial industry to GDP as an indicator to measure the degree of financial industry expansion and constructs instrumental variables that are suitable for the Chinese financial environment. Furthermore, it investigates the regional differences in the impact of financial industry expansion on financial risks and constructs a model of moderating effects to examine the transmission mechanism through which financial industry expansion affects financial risks. This paper provides insights into the mechanism by which factors of financial industry expansion contribute to the breeding of financial risks and offers empirical evidence for improving the financial system and controlling financial risks.

2. Literature review and theoretical analysis

Existing literature on the influencing factors of financial risk reveals that the driving factors of financial risk primarily lie in market volatility, economic development level, economic structure, and government intervention. Current research indicates that the economic development level and policy factors also significantly affect financial risk. Market-oriented policy reforms have a restraining effect on the credit risk of commercial banks, while factors such as local government debt risk, real estate financial risk, and financial governance level are crucial factors contributing to the increase in financial risk (Zhu Peihua & Li Junlin, 2021; Wu Zhenyu & Tang Chao, 2021).

The impact of financial industry expansion is mainly manifested in economic growth and the development of the real sector. Financial risks may transmit differently in various markets. In the stage of relatively independent development, the inhibitory effect of financial expansion on the manufacturing sector is not significant. However, when there is a strong constraint relationship between the financial industry and the manufacturing industry, financial expansion has a noticeable crowding-out effect on the real economy, mainly represented by the industrial sector (Wei Jie & Wang Hao, 2018; Zhang Jie, 2021). Moreover, the impact of financial expansion may vary across different regions. Zhang Jie's (2021) study also demonstrates that in the relatively backward central and western provinces with less developed industries, financial expansion leads to a significant increase in the fundraising capacity of local governments. On the other hand, in regions where the proportion of financial industry value-added is higher, financial expansion exhibits a more pronounced inhibitory effect on fixed asset investment.

Existing research indicates that financial expansion has both promoting and inhibiting effects on financial risks. Moderate financial expansion can stimulate economic development, while excessive financial expansion is prone to trigger financial risks, negatively impacting the development of the real economy (Dong Yanling & Nie Qian, 2020; Radu, 2021). Mahir and Aytül's (2020) study, focusing on 149 emerging, developing, and developed countries, also points out that the level of financial industry development significantly enhances the risks faced by banks.

Regarding specific sectors, Qian Zongxin and Wang Fang (2021) confirm that before 2008, moderate financial expansion had a promoting effect on the growth of the real estate industry. However, after 2008, with changes in economic structure and growth patterns, the sensitivity of real estate industry growth to financial expansion has decreased. Based on this, a hypothesis arises that when the financial industry reaches a certain level of development, excessive financial expansion not only fails to drive economic prosperity but may also lead to an increase in the non-performing loan ratio of commercial banks and the accumulation of financial risks.

To investigate this hypothesis, further analysis is needed to examine the transmission mechanism through which financial expansion affects financial risks. The level of financial marketization can weaken the impact of financial expansion on financial risks. The gradual establishment of market order is conducive to maintaining a stable financial environment and curbing the breeding of financial risks. On the other hand, aggressive expansion in the real estate sector may stimulate the impact of financial expansion and exacerbate the generation of financial risks. Financial decentralization by local governments can also stimulate the effect of financial expansion on financial risks. Differences in the allocation of financial resources promote competition among local governments. In the pursuit of accelerated economic development, local governments may overlook the prevention of financial risks. Additionally, improved financial regulation aids in preventing financial risks. The implementation of effective financial regulatory policies contributes to controlling financial risks. Conversely, incoherent financial regulatory policies can cause imbalances in resource allocation and a decline in market enthusiasm, thus facilitating the breeding of financial risks.

3. Model and Variables

(A) Variables and Data

1. Core Variables

Predicted Variable: Financial risk is measured by the non-performing loan ratio (Npl) of commercial banks[12]. A higher non-performing loan ratio indicates a larger proportion of loans that banks may be unable to recover, leading to a weakened functionality of banks and impacting the entire financial market. The increase in financing costs for businesses can also lead to a rise in illegal fundraising, exacerbating the deterioration of the economic environment.

Explanatory Variable: Financial industry expansion is measured by the proportion of financial industry value added to GDP (Fgdp). The rapid growth of China's financial industry and its excessive expansion are important factors contributing to the breeding of financial risks. To mitigate the influence of data fluctuations, logarithmic transformations are applied to the aforementioned variables.

2. Control Variables

Financial risk is also influenced by other macroeconomic and socio-governmental factors. The following variables, in logarithmic form, are selected as control variables: Financial development level (Bl) is measured by the amount of bank loans; Government intervention level (Pfe) is measured by fiscal expenditure; Technological factors (Pat) are measured by the number of patent applications accepted; Industrial structure (Is) is measured by the proportion of the tertiary industry; Urbanization level (Urb) is measured by the ratio of urban population.

3. Moderating Variables

To further analyze the transmission mechanism through which financial expansion affects financial risks, the following variables, in logarithmic form, are selected as moderating variables: Real estate investment (Cbd) is measured by the proportion of real estate investment to GDP; Financial decentralization (Loan) is measured by the ratio of per capita loans in each province to the national per capita loans; Level of factor marketization (Fmarket) is measured by the factor market index; Financial regulation (Finra) is measured by financial regulatory expenditures.

4. Data Sources

This study uses data from 30 provinces in China (excluding Tibet) for the period from 2006 to 2019, with a total of 420 data points selected for empirical analysis. The data for the factor market index are obtained from the "China Provincial Marketization Index Database," while the data for other variables are sourced from the annual "China Statistical Yearbook." Descriptive statistics for each variable are presented in Table 1.

Table 1: Descriptive Statistics

Variable Names	Variables	Sample size	Mean	Standard deviation	Minimum	Maximum
Non-performing loan ratio of commercial banks	Npl	420	2.882	3.688	0.35	24.6
Financial industry expansion	Fgdp	420	5.762	3.141	1.091	19.628
Financial development	Bl	420	124.407	44.008	53.721	258.472
Government intervention	Pfe	420	22.774	9.834	8.372	62.835
Technological factors	Pat	420	69272.38	112978.3	325	807700
Industrial structure	Is	420	43.984	9.629	28.6	83.5
Urbanization	Urb	420	55.134	13.748	27.46	89.6
Real estate investment	Cbd	420	12.526	5.824	3.969	46.02
Financial decentralization	Loan	420	1.151	0.964	0.421	6.502
Factor marketization	Fmarket	420	7.827	2.997	0.951	15.692
Financial regulation	Finra	300	12.061	18.88	0.01	161.07
Non-performing loan amount of commercial banks	Npb	420	337.401	373.948	6.2	2528.3

(B) Model Specification

To examine the impact of financial expansion on the breeding of financial risks, this study constructs the following basic panel data model.

$$\ln Npl_{it} = \alpha_0 + \alpha_1 \ln Fgdp_{it} + \alpha_2 \ln Fgdp2_{it} + \alpha_3 \ln Control_{it} + \lambda_i + \mu_t + \varepsilon_{it}$$

Where i represents provinces, t represents years, $lnNpl_{it}$ denotes the non-performing loan ratio of commercial banks. $lnFgdp_{it}$ represents the explanatory variable, the proportion of financial industry value-added to GDP, and $lnFgdp2_{it}$ represents its squared term. $lnControl_{it}$ represents the control variables, financial development level (Bl), government intervention level (Pfe), technological factors (Pat), and industrial structure (Is). λ_i represents the individual fixed effects, μ_t represents the time fixed effects, ε_{it} represents the stochastic error. α_0 represents the intercept term, α_1 represents the coefficient of the financial expansion variable, α_2 represents the coefficient of the squared term of the financial expansion variable, α_3 and represents the coefficients of the control variables.

This study constructs a model of moderating effects to examine the pathway through which financial expansion affects financial risks.

$$lnNpl_{it} = \alpha_0 + \alpha_1 lnFgdp_{it} + \alpha_2 lnFgdp2_{it} + \alpha_3 lnControl_{it} + \alpha_4 lnFgdp_{it} * Mediator_{it} + \alpha_5 lnFgdp2_{it} * Mediator_{it} + \lambda_i + \mu_t + \varepsilon_{it}$$

Where $Mediator_{it}$ represents the moderating variables, real estate investment (Cbd), financial decentralization (Loan), level of factor marketization (Fmarket), and financial regulation (Finra) $lnFgdp_{it} * Mediator_{it}$ represents the interaction terms, $lnFgdp2_{it} * Mediator_{it}$ and represents its squared term. α_4 and α_5 represent the coefficients of the interaction terms.

4. Empirical Results and Discussion

(A) Overall Sample Test Results

To enhance the robustness of the tests, this study gradually introduces the squared terms of the explanatory variables and control variables. The basic test results of the impact of financial expansion on financial risks are presented in Table 2. In Model (1), the estimated coefficient of the financial expansion variable is -0.263, significant at the 5% level, indicating that financial expansion contributes to the mitigation of financial risk breeding. In Model (2), the introduction of the squared term of financial expansion yields an estimated coefficient of 0.230, which is significant. Additionally, the coefficient of the linear term of financial expansion is -0.826, also significant. These results suggest that moderate financial expansion has an inhibitory effect on the breeding of financial risks, while excessive financial expansion leads to greater financial risks. The relationship between financial expansion and financial risk exhibits an inverted U-shaped pattern. Model (4) demonstrates that even after incorporating the squared term of the explanatory variable and control variables, the relationship between financial expansion and financial risk continues to exhibit an inverted U-shaped pattern. Moreover, the goodness of fit of the model improves. Estimations based on this model are considered more scientifically grounded.

Table 2: Basic Test Results of the Impact of Financial Expansion on Financial Risks

	(1)	(2)	(3)	(4)
Fgdp	-0.263** (0.115)	-0.826*** (0.241)	-0.691*** (0.141)	-1.368*** (0.257)
Fgdp2		0.230*** (0.098)		0.271*** (0.087)
Bl			0.608** (0.273)	0.561** (0.271)
Pfe			-0.308 (0.294)	-0.216 (0.292)
Pat			0.324*** (0.088)	0.327*** (0.087)
Is			1.334*** (0.372)	1.347*** (0.367)
Urb			-0.343 (0.456)	0.011 (0.464)
Time Effects	Controlled	Controlled	Controlled	Controlled
Regional Effects	Controlled	Controlled	Controlled	Controlled
Intercept	2.421	2.706	-5.488	-6.592
R ²	0.793	0.797	0.809	0.814
Obs	420	420	420	420

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The standard errors are presented in brackets below the regression coefficients. The same applies to the following tables.

(B) Heterogeneity Analysis

Building upon Model (4) in Table 2, this study further analyzes the impact of financial expansion on financial risks in different regions and varying levels of economic development.

There are notable differences in the influence of financial expansion on financial risks between the eastern and central-western regions. In the eastern region, there is a significant “inverted U-shaped” relationship between financial expansion and financial risks. However, in the central-western region, the impact of financial expansion on financial risks is not significant. The primary reason for this disparity is believed to be the stronger correlation between financial risks in the central-western region and policy factors, which makes them less affected by financial industry expansion.

The influence of financial expansion on financial risks also exhibits significant differences between economically developed and underdeveloped regions. In economically developed regions, the squared term of financial expansion is not significant. In contrast, in underdeveloped regions, financial expansion initially suppresses and then stimulates financial risks, indicating an “inverted U-shaped” relationship. The main reason behind this is that financially developed regions have already reached a high level of financial industry development, with a declining proportion of financial industry value-added to GDP, which helps to mitigate the breeding of financial risks. On the other hand, underdeveloped regions have a lower level of financial industry development compared to economically developed regions, with a larger proportion of financial industry value-added to GDP. Excessive financial expansion in these regions tends to foster financial risks.

Table 3: Heterogeneity Test Results of the Impact of Financial Expansion on Financial Risks

	Eastern Region	Central-Western Region	Economically Developed Region	Underdeveloped Region
Fgdp	-2.837*** (0.516)	-0.244 (0.286)	-1.384*** (0.443)	-0.995*** (0.305)
Fgdp2	0.520*** (0.182)	0.127 (0.095)	0.137 (0.129)	0.469*** (0.108)
Bl	1.145** (0.488)	-0.616** (0.306)	2.388*** (0.373)	-1.514*** (0.340)
Pfe	-1.328*** (0.485)	1.189 *** (0.363)	-0.411 (0.369)	1.377*** (0.376)
Pat	0.726 *** (0.181)	0.148* (0.086)	0.364*** (0.119)	0.344*** (0.097)
Is	3.989*** (0.861)	-0.388 (0.362)	1.933*** (0.507)	-0.196 (0.416)
Urb	2.0467* (1.176)	0.811 (0.602)	1.197* (0.710)	0.923 (0.697)
Time Effects	Controlled	Controlled	Controlled	Controlled
Regional Effects	Controlled	Controlled	Controlled	Controlled
Intercept	-28.008	-0.940	-22.201	0.344
R ²	0.781	0.896	0.834	0.914
Obs	154	266	210	210

(C) Moderation Analysis

In this study, the moderating variables of marketization level of factors (Fmarket), real estate investment (Cbd), financial decentralization (Loan), and financial regulation (Finra) were introduced to examine the pathways through which financial expansion affects financial risks. Table 3 presents the moderating effects on the impact of financial expansion on financial risks. The results indicate that the development of factor marketization and real estate investment contribute to delaying or mitigating the effects of financial industry expansion on the breeding of financial risks. On the other hand, financial decentralization and financial regulation intensify the effects of financial industry expansion in fostering financial risks.

Table 4: Estimated Results of the Impact of Financial Expansion on Financial Risks based on Moderation Effects

	(5)	(6)	(7)	(8)
Fgdp	-1.488** (0.582)	1.968*** (0.530)	-1.276*** (0.299)	-0.588 (0.562)
Fgdp2	0.249 (0.285)	-1.234*** (0.256)	0.232** (0.103)	0.212 (0.167)
Fgdp*Fmarket	0.103 (0.199)			
Fgdp2*Fmarket	-0.004 (0.108)			
Fgdp*Cbd		-1.460*** (0.196)		
Fgdp2* Cbd		0.636*** (0.095)		
Fgdp*Loan			-0.983*** (0.330)	
Fgdp2*Loan			0.335*** (0.127)	
Fgdp*Finra				0.226*** (0.063)
Fgdp2* Finra				-0.113*** (0.032)
Bl	0.559** (0.279)	0.525** (0.253)	1.088*** (0.327)	0.305 (0.370)
Pfe	-0.185 (0.293)	0.360 (0.283)	-0.460 (0.306)	0.402 (0.353)
Pat	0.309*** (0.088)	0.335*** (0.081)	0.325*** (0.086)	0.237** (0.097)
Is	1.301*** (0.370)	1.601*** (0.343)	1.057*** (0.379)	0.558 (0.447)
Urb	0.174 (0.557)	1.316*** (0.472)	1.238* (0.629)	0.412 (0.743)
Time Effects	Controlled	Controlled	Controlled	Controlled
Regional Effects	Controlled	Controlled	Controlled	Controlled
Intercept	-6.993	2.706	-12.025	-8.103
R ²	0.815	0.797	0.818	0.608
Obs	420	420	420	300

(D) Robustness Analysis

To further examine the reliability of the regression results, this study conducted robustness tests using three approaches: 1) Lagged effects were introduced by lagging the first-order and second-order terms of the explanatory variable, financial expansion, by one period; 2) Variable substitution was applied by replacing the measurement indicator of the dependent variable, commercial bank non-performing loan ratio (Npl), with commercial bank non-performing loan amount (Npb), to assess the consistency of the regression results; 3) Instrumental variable estimation was employed by selecting the lagged first-order and second-order terms of financial expansion as instrumental variables.

The robustness test results presented in Table 5 demonstrate the soundness of the regression results obtained earlier, indicating the validity of the analysis conducted in this study regarding the mechanism through which financial expansion influences financial risks.

Table 5: Robustness Test Results of the Impact of Financial Expansion on Financial Risks

	One-period lag	Variable substitution method	Instrumental variable estimation
Fgdp	-1.057*** (0.276)	-1.309*** (.254)	-1.572*** (0.532)
Fgdp2	0.308*** (0.092)	0.283*** (.086)	0.400*** (0.149)
Bl	0.198 (0.279)	0.954*** (0.267)	0.360 (0.358)
Pfe	0.241 (0.319)	-0.393 (0.288)	0.172 (0.296)
Pat	0.263*** (0.095)	0.363*** (0.086)	0.284*** (0.091)
Is	0.986** (0.408)	0.976*** (0.363)	1.112*** (0.369)
Urb	0.484 (0.518)	1.013** (0.459)	-0.665 (0.537)
Time Effects	Controlled	Controlled	Controlled
Regional Effects	Controlled	Controlled	Controlled
Intercept	-6.571	-7.146	-10.362
Cragg-D F statistic			107.038
R ²	0.753	0.812	0.786
Obs	390	420	390

5. Conclusions and Recommendations

Based on the rapid expansion of China's financial industry in recent years, this study analyzed the impact mechanism of financial expansion on financial risk. Empirical tests were conducted to examine the influence of financial expansion on financial risk and its transmission path. Additionally, heterogeneity analysis was conducted at the regional level. The following conclusions were drawn:

Firstly, there exists a significant inverted U-shaped relationship between financial expansion and financial risk. Moderate financial industry expansion helps to suppress the emergence of financial risk, but excessive expansion exacerbates financial risk.

Secondly, the influence of financial expansion on financial risk varies across regions. It is more pronounced in the eastern regions or economically underdeveloped areas.

Thirdly, the development of factor markets and real estate investment contribute to mitigating the effects of financial expansion on the emergence of financial risk, while financial decentralization and financial regulation intensify the effects of financial expansion on the emergence of financial risk.

These findings provide policy insights:

First, it is important to promote financial industry expansion in a rational manner. The negative impacts of excessive expansion on financial risk and the economy should be recognized. The focus of financial development should shift from "high speed" to "high quality," meeting the needs of the real economy. Moderate expansion of the financial industry is conducive to controlling financial risk.

Second, efforts should be made to prevent and mitigate risks in the financial market. Enhancing the service capabilities of the financial sector, strengthening the financing function of banking institutions, and reducing financing costs from the supply side are essential. Additionally, banks should enhance their risk resilience, improve internal control systems for managing high-risk loans, and prevent the occurrence of large-scale non-performing loans. Adherence to market principles and maintaining a sound credit environment in the financial market are also crucial, with strict measures to prevent illegal financial market transactions.

Third, local governments should manage the financial system in a reasonable and regulated manner to prevent the exacerbation of financial risk due to factors such as financial decentralization and financial regulation. The use of preferential policies to stimulate financial industry expansion should

be controlled, while actively promoting coordinated and harmonious development across various industries at the local level.

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