Hindawi
Mathematical Problems in Engineering
Volume 2022, Article ID 9634999, 8 pages
https://doi.org/10.1155/2022/9634999

Research Article

Data Mining and Economic Application in the Age of Financial Big Data: A Case Study of Shadow Banking and Interest Rate Liberalization in China

Shi Liang

School of Economics and Business Administration, Central China Normal University, Wuhan 430073, Hubei, China

Correspondence should be addressed to Shi Liang; liangshi@mails.ccnu.edu.cn

Received 11 March 2022; Revised 21 April 2022; Accepted 22 May 2022; Published 20 June 2022

Academic Editor: Xuefeng Shao

With the booming of big data in finance, data mining technologies, as a new method of data statistics, have made superior economic applications available to researchers. Based on the relationship between shadow banking and interest rate liberalization, this paper intended to analyze the bidirectional relationship between shadow banking and interest rate liberalization using big data mining technologies. The relationship between data mining and the economic application of shadow banking was proven using data from 2014 to 2021. On this basis, this paper identified the bidirectional influence between shadow banking and interest rate liberalization. The findings show that shadow banking has positive contributions to the liberalization of interest rate, and the interest rate distortion resulting from interest rate control also drives the development of shadow banking. Moreover, feasible suggestions have been proposed for supervision on policies.

1. Introduction

Technologies represented by 5G, big data, artificial intelligence (AI), blockchain, and cloud computing have become the main players in today's financial technology development, and among them, big data technology with its wide-ranging implications is the top priority. Data mining technology, as a new method of data statistics, can achieve in-depth data mining horizontally, thus meeting the needs for the accuracy of economic statistical data as well as scientific analysis and decision-making. Focusing on the relationship between shadow banks and interest rate liberalization, by analyzing large data mining technology out of the traditional economic statistics to the observation of the shadow banking representative data and interest rate marketization, before it is different from the theoretical analysis of scholars, this article, from the perspective of empirical based on shadow banking and interest rate marketization of the bidirectional relationship, proposed the new application of data mining, and for later related scholars, the study provides a reference basis.

The currency creation mechanism has shifted to the complex model of "central bank-commercial bank-off-balance-sheet-shadow banks" from the previous simple model of "central bank-commercial bank." Also, the Central Bank, the Banking Regulatory Commission, the Insurance Regulatory Commission, and the Securities Regulatory Commission have formulated new regulations to control the leverage rate of shadow banks. As a result, the leverage ratio will be uniformly applied to products launched by all types of financial institutions in an attempt to eliminate regulatory arbitrage and embark on the regulation of shadow banks in China. The relationship between shadow banking supervision and financial marketization has become the focus of government, industry, and academia.

1.1. Connotation of Shadow Banks. Discussions on the specific definition and connotation of shadow banks can be found in a great deal of literature at home and abroad. From a global point of view, the term was first proposed by McCulley, the executive director of PIMCO, at the annual meeting of Jackson Hole held by the Federal Reserve in 2017,

drawing extensive attention and leading to profound research in the financial community. According to McCulley, unlike traditional commercial banks, shadow banks, specialized in businesses similar to traditional commercial banks, are outside the traditional commercial banking system for their leveraged financial products are launched through non-bank investment channels. In consequence, some level of concern has been aroused in the financial innovation means of shadow banks. With reference to the definition of shadow banks by IMF, regarding whether shadow banks should be supervised by the corresponding department, Bill Gross (2007) held that shadow banks are complex financial instruments formed by multilayer packaging on the basis of basic financial derivatives, lacking supervision. Secondly, concerning whether it corresponds to traditional banks and exerts an impact on the real economy, Gorton et al. (2010) suggested that non-bank financial institutions make profits from complex financial instruments, being significantly different from those of traditional commercial banks. Regarding whether it plays the role of credit intermediary, Paul Tucher (2010) stated that shadow banks, featuring term mismatch and increased leverage rate, can partially substitute the business of commercial banks via institutions that are independent or cooperated with traditional banks.

In terms of supervision and business, as for scholars worldwide, whether it is a credit intermediary or financial intermediary existing outside the banking system with engagement in asset securitization and independence of relevant departments is a criterion for shadow banks. Concerning the Chinese market, shadow banks in China have a significant degree of localization since the financial market development, social and economic development structure, and related regulatory measures in China are significantly different from those in major Western economies. In China's shadow banking, the definition of shadow banking is different in some aspects, and the specific features of China's shadow banking are shown in Table 1.

Chinese experts focus more on the scale and boundary of shadow banks. Ba [1] defined that shadow banks in China are composed of bank wealth financing, trust, and financial companies. As for Li (2012), shadow banks in China consist of Off-Balance Sheet Activities (OBS) of commercial banks as well as businesses and institutions that can function as a credit intermediary outside the banking system. Shadow banking funds mainly come from wholesale financing, lack stable sources of funds such as core deposits, and engage in a large number of over-the-counter transactions, and information is not transparent, and the leverage ratio is usually high. Based on the previous description, the Criteria for Differentiating Shadow Banks in China are shown in Table 2.

1.2. Connotation of Interest Rate Liberalization. Interest rate liberalization means that the pricing interest rate that financial institutions depend on is determined by market supply and demand. In his study on the U.S. banking industry from 1970 to 1986, de Rezende [2] found that financial innovation and reform of the interest rate liberalization in the U.S. were triggered by the choice of capital investment outside the bank channel, as the low deposit interest rate of banks is not appealing under the restraint of *Q* treaty. Xiao [3] believed that the pricing mechanism of shadow banks can better reflect the supply and demand of market funds, contributing to the marketization of RMB interest rates. Ba [1] held that shadow banks can break interest rate control in disguised form and meet market financing needs via the regulation of market funds using the market-based pricing mechanism, thereby enhancing interest rate liberalization. Dang et al. (2014) believed that individual investors who gain fewer earnings from investment under the long-standing dual-track interest rate system and strict deposit and loan interest rates in China tend to invest in financial products with a high rate of return, further stimulating the development of bank financial products. Barth et al. (2015) held that the development of shadow banks in China is driven by the long-term control over interest rate upon analyzing China's empirical data.

Compared with previous studies, this study presents the following marginal contributions: (a) we studied the problems of shadow banks and market interest rate from status analysis based on the latest monthly data from 2014 to 2021; (b) we find evidence for the bidirectional relationship between shadow banks and liberalized interest rates. (c) We proposed opinions based on independent thinking in the general background that "the financial management departments shall quickly carry out countermeasures on shadow banks in an attempt to eliminate systemic financial risks under the leadership and deployment of the Party Central Committee and the State Council of China."

2. Research Hypothesis

Theoretically, a bidirectional relationship can be observed between shadow banks and interest rate liberalization. The shadow banking system in developed countries is to make greater profits using innovative financial tools with interest rate liberalization as the foundation and asset securitization as the main business. However, shadow banks in China have been developed under long-term financial repression, that is, born and developed from interest rate control. To some extent, the financing demands of enterprises in urgent needs of loans cannot be met under the extremely low interest rate liberalization caused by interest rate control, hampering the emergence and development of shadow banks.

2.1. Influence of Interest Rate Liberalization on the Development of Shadow Banks. The American economist E. J. Kane proposed the theory of circumvented regulation in 1984 and believed that financial innovation is caused by the behavior of banks making profits through circumventing regulation of government agencies. Financial institutions actively innovate to circumvent restrictive measures imposed by the administrative control of government agencies over certain profitable activities, making them unable to maximize profits.

Table 1: Features of shadow banking in China.

Features	Implications
Centralization	With the bank as a core, it is manifested as the "shadow of the bank"
Arbitrage	Targeted regulatory arbitrage, violations of laws and regulations are commonly seen.
Rigid payment	There is a rigid payment or an expectation of rigid payment
Channel charge	The profit model of channel charge is widely seen
Credit risk	It is dominated by quasi-loans with prominent credit risks

Table 2: Criteria for differentiating shadow banks in China.

Standards	Implications
Supervisory circumvention	Financial credit intermediary activities are not part of the banking supervision system
High leverage	Complicated business structure, nested layers and excessive leverage.
Non-transparent information	Incomplete disclosure and low transparency
Highly contagious	High pressure on centralized cash as well as high association and risk contagion in the financial system

Interest rate control policies are formulated by the government to manage the interest rate of the financial market for adjusting economic operations. As an essential part of the interest rate policy, it plays an important role in the performance of economic leverage by interest rate. Interest rate is critical in maintaining financial stability, and its changes may affect the direction and efficiency of resource allocation.

Interest rate control will increase financing costs at a low level of interest rate liberalization, leading to disruption in the normal competition among financial institutions. The rapid development of shadow banks is ultimately driven by the demands of circumventing interest rate controls.

2.2. Influence of Shadow Banking System on Interest Rate Liberalization. Luo and Feng [4] believe that the rapid development of shadow banking has changed China's traditional monetary policy transmission mechanism. The investment and financing business of shadow banks, as products of financial innovation, can partly serve as a substitution for the deposit and loan business of traditional commercial banks. The interest rate of shadow banks is priced to the market under the negotiation of the supply and demand ends of capital, which can press ahead with the reform in commercial banks to relax the restrictions on deposit and loan interest rates. In this way, it can enhance interest rate liberalization.

2.2.1. Role of Shadow Banking Innovation in Financing Channels. As China's shadow banking system is developed under the special financial environment in China, its influence on the real economy is also complex. In the positive aspect, it can broaden the financing channels of the real economy and optimize the investment structure of the real economy [5]. The loan interest rate of bank credit is determined by the banking system. On the contrary, in the shadow banking market, borrowers are allowed to choose from capital prices and sources, which not only broadens the financing channels of enterprises, but also makes up for the deficiencies of traditional financing channels and intensifies competition in the banking industry. This can partly ease the overcontrol of interest rates, so that the loan interest rate can be floated to the market equilibrium interest rate, that is, improving the liberalization of loan interest rates.

2.2.2. Role of Shadow Banking Innovation in Investment Channels. Regarding investment channels, shadow banks launch products that are significantly different from traditional investment channels and consistent with the needs of investors under continuous innovation, making a variety of products available to investors. At the same time, investors can choose between risks and returns of the two investment channels and play games with financial institutions, which can promote the liberalization of deposit interest rates to a certain extent.

2.2.3. Role of Shadow Banking Innovation in the Pricing Mechanism. Concerning the pricing mechanism, different from the traditional pricing model of deposit and loan interest rates anchored by benchmark interest rates, a quantitative pricing model is adopted in the interest rates of shadow banks business such as trust products and interbank payment, better reflecting the real supply and demand relationship of capitals in the financial market. The formation of the shadow banking pricing mechanism can promote the further development of the financial market and the reform in interest rate liberalization.

At the same time, the interest rate control causes the low degree of marketization of interest rate, and capital price distortions may also promote the development of the scale of the shadow banking. Huang Yi's (2012) study, such as trust, asset management plan channel bank docking shadow banking businesses such as financial capital, is the financial repression and monetary tightening policy taken by the folk interest rate marketization; accordingly, This paper proposes the following two hypotheses:

Hypothesis 1. Low liberalization level of interest rate and the distortion of capital prices caused by interest rate control contribute to the scale development of shadow banks, and

the liberalization level of interest rate is negatively associated with the growth rate of shadow banks; that is, the lower the liberalization of interest rate is, the faster the scale development of shadow banks will be.

Hypothesis 2. Shadow banks accelerate the interest rate liberalization, and the liberalization level of interest rate is positively related to the growth rate of shadow banks; that is, the faster the scale development of shadow banks in China is, the higher the liberalization of interest rate will be.

3. Sample and Research Design

3.1. Sample Selection and Data Sources. The monthly data from 2014 to 2021 obtained through big data mining, together with data from the CSMAR database and the website of the People's Bank of China, are used as research samples. Two indicators were selected. One is Sbank. According to the "Report on Shadow Banks in China" compiled by the research group of the China Banking and Insurance Regulatory Commission (CBIRC), as well as research by related scholars [6], it is found that entrusted loans, trust loans, and the sum of undiscounted bank acceptances have high proportions of the current scale of shadow banks in China. The scale of shadow banks in China was measured using the sum of entrusted loans, trust loans, and the sum of undiscounted bank acceptances, and its development was measured using the growth rate of the scale. The second indicator is variables related to interest rate liberalization. Interest rate liberalization was divided into loan interest rate liberalization and deposit interest rate liberalization according to the previous study [7–9]. DRD, LRD, DRG, and LRG were selected as indicators for measuring the liberalization level of interest rate, with detailed implications shown in Table 3. All variables in Table 3 are seasonally adjusted except for the benchmark interest rate.

The liberalization level of interest rates is represented by the distorted degree of interest rates. Since interest rate control is manifested in overestimation of loan and loan interest rate as well as underestimation of deposit interest rate, LRD is normally positive, presenting that the larger the value, the lower the liberalization level of interest rate. The distorted degree of deposit interest rate is usually negative, presenting that the greater the value, the lower the liberalization level of interest rate. Similarly, the excessively high variation in the loan interest rate or the excessively low variation in the deposit interest rate also indicates the low liberalization level of interest rates.

3.2. Model Design. In order to prove Hypothesis 1, this paper refers to the study of Zhao, [7, 10]; and on this basis, the regression model is set as

$$Sbank_t = \alpha + \beta_1 LRD_t + \beta_2 DRD_t + \beta_3 LRG_t + \beta_4 DRG_t + \epsilon_t. \quad (1)$$

Using the simplified OLS model, the influence of liberalized interest rates on the expansion of Sbank ($Sbank_t$) can be observed through the results of β_1 and. β_2

To prove Hypothesis 2, the regression model was set as

$$LRD_t = \alpha + \beta_1 Sbank_t + \beta_2 DRD_t + \beta_3 LRG_t + \beta_4 DRG_t + \epsilon_t, \quad (2)$$

$$DRD_t = \alpha + \beta_1 Sbank_t + \beta_2 LRD_t + \beta_3 LRG_t + \beta_4 DRG_t + \epsilon_t. \quad (3)$$

The simplified OLS model was also adopted. This model can further judge the two-way influence relationship between Shadow banking and interest rate liberalization in China. To be specific, the influencing level of the expansion of Sbank ($Sbank_t$) on liberalization of deposit interest rate and liberalization of loan interest rate can be elementally proven together with the results of β_1 coefficient of (2) and (3). To obtain robust results, regression is performed on LRD_t after taking the absolute value (Abs_LRD_t) with consideration that DRD is normally negative. Moreover, regressions with and without control variables are also performed on (2) and (3) as whether DRG and LRG have impacts on DRD and LRD is inclusive.

4. Analysis of Empirical Results

4.1. Descriptive Statistical Analysis. Descriptive statistical results of the main research variables are shown in Table 4. As the results indicate, shadow banks have been expanded on a large scale in recent years. But less information can be observed for time series variables. Thus, a time trend of main research variables is also plotted.

Figure 1 shows the expansion of shadow banking, As it shows, shadow banks before 2017 are expanded drastically, since the Central Economic Work Conference called for greater importance to be placed on the prevention and resolution of financial risks at the end of 2016. The 15th meeting of the Central Financial and Economic Leading Group, held at the beginning of 2017, emphasized that it is of great necessity to timely compensate for the deficiencies of supervision and resolutely control market chaos. The drastic and irregular growth of shadow banks was effectively curbed upon three-year efforts in special governance.

We can also see that the marketization level of interest rate also presents a significant watershed around 2017. While the savage growth of shadow banking is being regulated, the actual marketization level of interest rate also presents a downward trend, which indicates that the expansion trend of silver banks is strongly correlated with the market interest rate. When the interest rate control intensity is greater, the shadow banking system in China will develop faster. The price of market funds is not the cause of shadow banking.

4.2. Main Empirical Regression Results. Benchmark regression was performed according to the above-mentioned hypotheses, with results shown in Table 5.

Column (1) shows that Sbank is significantly positively correlated to LRD and significantly negatively associated with DRD, proving Hypothesis 1 that the low liberalization level of interest rate and the distortion of capital price caused by interest rate control have advanced the scale development of shadow banks. To further verify Hypothesis 1, the author

Table 3: Measurable indicators for liberalization level of interest rates and scale expansion of shadow banks.

Variable type	Variable name	Implications
Explained variables	Sbank	Year-on-year growth rate of entrusted loans, trust loans, and the sum of undiscounted bank acceptances
Explaining variables	DRD	Benchmark deposit rate - market interest rate
	LRD	Benchmark loan rate - market interest rate
	DRG	Benchmark loan rate - inflation rate
	LRG	Benchmark deposit rate - inflation rate

Table 4: Statistical description of variables to Be studied.

Variables	Observation	Average	Median	Standard deviation	Minimum	Maximum
Sbank	69	0.177	−4.200	26.65	−36	55.50
LRD	63	1.295	1.577	0.810	−2.787	2.408
DRD	63	−1.510	−1.278	0.594	−2.631	−0.570
LRG	63	−96.92	−96.75	1.326	−102.7	−94.80
DRG	63	−99.77	−99.61	1.068	−102.8	−98

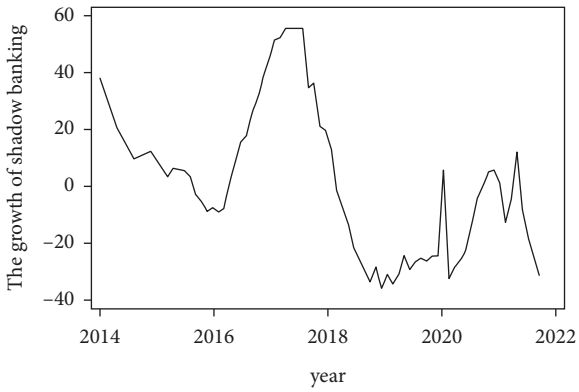

Figure 1: The expansion of shadow banking.

proves that the correlation coefficient between LRD and DRD and Sbank at faster Sbank is significantly greater than that at slow Sbank, and the latter has an insignificant correlation coefficient. Then, the second half of Hypothesis 1 is proved: the liberalization level of interest rates is positively related to the growth rate of shadow banks. In other words, the lower the liberalization level of interest rates, the faster the scale development of shadow banks in China. Evidently, the interest rate control system that distorts capital price is the main factor facilitating the emergence of the shadow banking system.

By regressing the OLS models of equation (2) and (3), the following results were obtained in Table 6:

Data given in the table show that Abs_LRD_t and DRR are remarkably inhibited by Sbank with or without control variable, proving Hypothesis 2 that the interest rate liberalization can be promoted by shadow banks to some extent. Similarly, Hypothesis 2 was verified through group regression.

The regression results in Table 7 show that LRD and DRD can only be suppressed when Sbank is high, leading to a higher level of interest rate liberalization. Besides, as the interest rate level begins to distort when Sbank stands low, the higher level of interest rate liberalization cannot be achieved by the reduction in market control and Sbank supervision.

The liberalization level of interest rate is positively related to the growth rate of shadow banks; that is, the faster the scale development of shadow banks in China is, the higher the liberalization level of interest rate will be.

4.3. Robust Regression Results. To achieve robust results, the data was further verified using the quantile regression model (as shown below) with reference to the research of some scholars [6,7]. For the multiple linear regression model $y_q = X'\beta + u_q$, solving the coefficient $\widehat{\beta}^q$ of the regression equation for the qth quantile is to minimize the following objective function:

$$Q = \sum_{i:y_i<X'\widehat{\beta}^q}^{n} q\left|y_i - X'\widehat{\beta}^q\right| - \sum_{i:y_i<X'\widehat{\beta}^q}^{n} (1-q)\left|y_i - X'\widehat{\beta}^q\right|, \quad (4)$$

where $y_i - X'\widehat{\beta}^q$ is the residual of the regression equation at the qth quantile.

Quantile regression was performed following the above-mentioned hypotheses, with the results shown in Table 8.

The impacts of LRD and DRD are insignificant at low quantile. It is probably because the shadow banks have no significant advantage in comparison with the on-balance sheet business of traditional banks when the interest rate and the official benchmark interest rate of shadow banks are low in quantile, thereby restraining the rapid development of shadow banks. At high quantile (Quantile≥0.5), on the other hand, the impacts of LRD and DRD on the scale of shadow banks are significantly positive and negative, respectively. Also, Table 5 shows that the estimated parameter of DRD in the absolute value is greater than that of LRD in this quantile no matter what the quantile is.

It indicates that the impacts of interest rate control on shadow banks in China over deposits and loans are asymmetric. The impacts of the distortion of deposit interest rate

Table 5: Main empirical regression results.

Variable	(1) Complete sample	(2) High expansion trend	(3) Low expansion trend
		Sbank	
LRD	17.224 *	26.961 ***	6.201
	(8.947)	(3.915)	(6.351)
DRD	−51.001 ***	0.000	−12.243
	(9.648)	(.)	(8.990)
LRG	−13.617 *	−9.487	−5.458
	(7.364)	(23.720)	(5.192)
DRG	21.136 ***	12.284	10.821 **
	(7.509)	(25.112)	(5.222)
N	63.000	30.000	33.000
R^2	0.701	0.652	0.318

(standard error in parentheses) $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 6: Main empirical regression results 2.

Variable	(1)	(2)	(3)	(4)
	No control variable		With control variables	
	Abs_LRD_t	*DRD*	Abs_LRD_t	*DRD*
Sbank	−0.015 ***	−0.017 ***	−0.018 ***	−0.019 ***
	(0.003)	(0.002)	(0.002)	(0.002)
LRG			0.743 ***	-0.014
			(0.090)	(0.070)
DRG			−0.590 ***	0.156 *
			(0.113)	(0.089)
N	63.000	63.000	63.000	63.000
R^2	0.251	0.583	0.686	0.639

Table 7: Group regression results.

Variable	(1)	(2)	(3)	(4)
	High expansion trend		Low expansion trend	
	Abs_LRD_t	*DRD*	Abs_LRD_t	*DRD*
Sbank	−0.025 ***	−0.025 ***	0.002	−0.003
	(0.004)	(0.004)	(0.014)	(0.006)
N	30.000	30.000	33.000	33.000
R^2	0.637	0.637	0.001	0.009

on the scale of shadow banks in China are stronger than those of the distortion of loan interest rate. The possible reason may be that the market-oriented reform of RMB loan interest rate has been faster than the liberalization level of RMB deposits, leading to a liberalization level of loan interest rate higher than that of deposit interest rate. Relatively, the more stringent control over deposit interest rate is more conducive to shadow banks to obtain more capital at low cost, thereby enabling investment inviting banks to grow increasingly larger in scale.

Hypothesis 1 is further proved to be robust and correct according to the empirical results of robust regression. When the liberalized level of interest rate is insufficient, a distortion of deposit and loan interest rates will be caused by the deviation between the official benchmark interest rate and the benchmark interest rate of the market. This is the condition for the birth of shadow banks. The greater the distorted degree is, and the lower the liberalized level is, the greater the development scale of shadow banks will be. Moreover, it is also found that the distortion of deposit interest rate is more conducive to the development of shadow banks than the distortion of loan interest rate.

The results of Table 9 show that Sbank can significantly enhance the liberalization level of loan interest rates under various quantiles, and the faster growth of Sbank at high quantile (≥0.5) can better contribute to the decline in the degree of LRD, thereby enhancing a higher level of deposit and loan interest rates in China. High consistency is presented in the same conclusion when it comes to the distorted

Table 8: Quantile regression results 1.

Variable	(1) Quantile0.2	(2) Quantile0.4	(3) Quantile0.6	(4) Quantile0.8
		Sbank		
LRD	6.575	14.425	20.680 *	29.602 **
	(19.090)	(9.750)	(12.171)	(12.921)
DRD	−34.932 *	−45.687 ***	−55.059 ***	−67.095 ***
	(20.585)	(10.513)	(13.124)	(13.933)
LRG	-6.213	-11.758	-16.142	−22.609 **
	(15.713)	(8.025)	(10.018)	(10.635)
DRG	15.767	19.694 **	22.339 **	28.991 ***
	(16.023)	(8.183)	(10.215)	(10.845)
N	63.000	63.000	63.000	63.000
R^2	0.251	0.583	0.686	0.639

Table 9: LRD quantile regression results.

Variable	(1) Quantile 0.2	(2) Quantile 0.4	(3) Quantile 0.6	(4) Quantile 0.8
		Abs_LRD_t		
Sbank	−0.016 ***	−0.019 ***	−0.019 ***	−0.023 ***
	(0.005)	(0.003)	(0.003)	(0.003)
DRD	0.939 ***	1.022 ***	1.090 ***	***
	(0.185)	(0.109)	(0.108)	(0.128)
LRG	−0.771 ***	−0.850 **	−0.968 ***	−0.964 ***
	(0.234)	(0.137)	(0.137)	(0.162)
N	63.000	63.000	63.000	63.000
R^2	0.251	0.583	0.637	0.657

degree of deposit interest rates; please refer to the appendix for details.

5. Conclusions and Inspiration

5.1. Conclusions. This paper found that, first, low liberalization level of interest rate and the distortion of capital prices caused by interest rate control contribute to the scale development of shadow banks, and the liberalization level of interest rate is negatively associated with the growth rate of shadow banks; that is, the lower the liberalization of interest rate is, the faster the scale development of shadow banks will be. Second, shadow banks can propel the interest rate liberalization, and the liberalization level of interest rate is positively related to the growth rate of shadow banks; that is, the faster the scale development of shadow banks in China is, the higher the liberalized degree of interest rate will be.

Shadow banks have pushed up the leverage level and elevated the financial and systemic risks in China together with associated contagion risks. There is no doubt that shadow banks should be regulated and tracked. But what CBIRC practices are absolutely right? Although it has clamped down on a variety of vicious shadow banks, CBIRC has implemented too many "one-size-fits-all" approaches to the supervision of shadow banks. The scales of investment inviting banks that can promote interest rate liberalization and even financial innovation in China have been directly reduced. It can be also found that the level of interest rate liberalization in China has been lowered with the declined scale of shadow banks. This paper believed that there must be an inevitable connection between the two. Efforts should be made to strengthen supervision over vicious shadow banks, and shadow banks that can promote financial innovation should also be protected. Only in this way can the financial market-based transformation in China be performed in a more comprehensive manner.

The author believes that various innovations in shadow banks have significantly elevated the market-oriented reform of RMB interest rates. More precisely, innovations in financing channels have improved the liberalization level of loan interest rates; innovations in investment channels have accelerated the market-oriented reform of deposit interest rates; innovations in the pricing mechanism have contributed to the establishment and improvement of the market-oriented formation mechanism of RMB interest rate in China; and innovations in supervision have propelled innovation and built a stable reform environment for interest rate liberalization.

5.2. Policy Suggestions

5.2.1. The Information Disclosure Mechanism Should Be Strengthened and Improved. In view of the conclusion that the low degree of interest rate liberalization caused by interest rate regulation and the distortion of capital price promote the scale development of shadow banking, this

paper suggests to strengthen the full disclosure of financial market information, which is conducive to the prevention and resolution of risks in the financial market apart from enhancing the operational efficiency of the financial market. The information disclosure mechanism of shadow banks can be strengthened in the following aspects. First, it is imperative to improve the regulatory transparency of the supervision departments, innovate risk indicators, and conduct regular assessments on risks and risk levels. Second, a statistical information disclosure mechanism for shadow banks and research on information disclosure and accounting methods for innovative financial products should be established to discover and resolve existing problems in a timely manner as well as to improve the quality and effectiveness of major information disclosure. Third, the overall quality of supervisors should be enhanced through regular training and assessment to improve their sensitivities to market changes and capabilities of risk early warning.

5.2.2. The Process of Interest Rate Liberalization Should Be Promoted in an Orderly Manner. In view of the conclusion that shadow banking promotes interest rate liberalization to a certain extent and that the degree of interest rate liberalization is positively related to the growth rate of shadow banking, this paper holds that gradually promoting interest rate liberalization is an important way to promote the sunshine development of shadow banking in China. Accelerating the interest rate liberalization is beneficial to reasonably determining the interest rate level, contributing to truly and accurately reflecting the relationship between market supply and demand, and lowering interest rate risks. More than that, it can also create an active trading environment and promote fair competition between traditional banks and shadow banks, improving the financial structure in China and advancing the healthy and stable development of the financial system.

5.2.3. The Self-Regulation of Relevant Subjects Should Be Improved. The presence of shadow banking has increased the level of leverage, financial and systemic risk in China, and the associated risk of contagion, Shadow banks should also improve and enhance their internal control mechanism while accepting external supervision. It is imperative to improve the internal control system of shadow banks, complete their risk monitoring mechanism, regulate their operation and management, and establish an effective and reasonable monitoring scheme. In this way, systemic risks can be prevented, offering a supporting mechanism for the effectiveness of external supervision.

5.2.4. International Regulatory Cooperation Should Be Enhanced. Domestic supervision is insufficient to deal with the problem of cross-border supervision over shadow banks. The global and the cross-border characteristics of shadow banks call for cross-border cooperation over their supervision. To this end, countries around the world should conduct cross-border cooperation and formulate regulations and policy agreements with cross-regional impacts, such as international agreements on minimum margin to limit the amount of leveraged financing used by financial institutions. In this way, cooperation in the supervision of shadow banks can be implemented regionally and even globally.[8–13].

Data Availability

No data were used to support this study.

Conflicts of Interest

There are no potential conflicts of interest in this study.

References

[1] S. Ba, "On strengthened supervision of shadow banking system," *China Financialyst*, vol. 49, no. 14, pp. 24-25, 2009.
[2] F. C. D. Rezende, "The structure and the evolution of the U.S. Financial system, 1945-1986," *International Journal of Political Economy*, vol. 40, no. 2, pp. 21–44, 2011.
[3] K. Xiao, *Monetary Transmission in Shadow banks*Columbia Business School, New York, USA, 2018.
[4] Z. Luo and Ke Feng, "Shadow banking and monetary policy transmission in China," *Wuhan Finance*, vol. 24, no. 04, pp. 19–22, 2012.
[5] C. Li and D. Yang, "Shadow banking's influence on the real economy in our country and the countermeasures," *Journal of economic aspect*, vol. 19, no. 03, pp. 106–111, 2017.
[6] A. Feng, L. Wang, X. Chen et al., "Developmental Origins of Health and Disease (DOHaD): implications for health and nutritional issues among rural children in China," *Bioscience trends*, vol. 9, no. 2, pp. 82–87, 2015.
[7] J. Zhao, "Reforms in Shadow banks, interest rate control and interest rate liberalization," *Shanghai Finance*, vol. 34, no. 06, pp. 50–55, 2019.
[8] Z. Mao and Y. Wan, "Research on the stable threshold effect of shadow banks and banking system in China," *International Finance Research*, vol. 35, no. 11, pp. 65–73, 2012.
[9] G. Dai and P. Fang, "Interest rate liberalization and bank risks: a study from the perspective of shadow banks and Internet finance," *Financial Forum*, vol. 19, no. 08, pp. 13–19+74, 2014.
[10] J. Li and X. Han, "Shadow banking and operational risks of non-financial enterprises," *Economic Research*, vol. 54, no. 08, pp. 21–35, 2019.