Impact of Characteristics of Board of Directors Towards Risk-Taking Level with Chinese Commercial Banks

ABSTRACT

Based on the situation that the overall economy is facing a huge shock due to COVID-19, China's banking sector plays an extremely important role as a provider of funds in the social economy and risk management is even more important. Therefore, this paper uses the Chinese commercial banks as a research sample of 730 from 2017 to 2021 and explores the moderating role of three board structure characteristics, namely, the board size, the combination of chairman and president, and the proportion of independent directors, on the relationship between banks' operation risk include market risk, credit risk and liquidity risk and risk-taking level in empirical approach method. The research findings revealed that: 1. liquidity ratio and cost-to-income ratio have a significant negative effect on the risk-taking level of commercial banks. 2. Board size has a negative moderating effect on the relationship between liquidity ratio and risk-taking level, which means that a larger board size can help reduce the effect of liquidity ratio on the risk-taking level of commercial banks. 3. Board size has a negative moderating effect on the risk-taking level of commercial banks. 4. The separation of chairman and president has a positive moderating effect on the relationship between liquidity ratio and risk-taking level, which means that having a different chairman and president may increase the impact of poor liquidity ratio on the risk-taking level of commercial banks. However, the cross-section of the cost-of-income ratio and independent director ratio has no significant effect on the risk-taking level. This paper also makes recommendations based on the findings of the study.

Keywords: Risk-taking level, board of directors; business risk.

1. INTRODUCTION

From the end of 2019, the COVID-19 outbreaks have been occurring around the world. In an international situation that was already becoming increasingly complex, the epidemic became a new superimposed factor affecting economic development, causing the operation of many economic and social fields to come to a halt, with all industries suffering a huge impact, and commercial banks, an indispensable partner in business operations, facing tremendous pressure. During the pandemic, most people could not go to work normally, leading to economic stagnation, and many SMEs closed down because they could not support them. During this period, banks' lending business was negatively impacted, and they were vulnerable to a capital crisis if they did not take appropriate risk management measures. One can refer to Sahin [1] for explanations of the risk measures and regulations towards banking as well as possible confidence decreasing behavior in the banking sector [2].

The corporate governance structure is mainly divided into three parts: the shareholders' meeting, the board of directors, and the management [3]. The main responsibility of the board of directors is to make major decisions for the company, and in the process of selecting directors, the company should try to take into account the background of the industry and the characteristics of the company and seek appropriate candidates to provide professional advice to the company with the help of their academic backgrounds and specialties, so that the suitability of these directors and the mode of cooperation may affect the quality of the final decision-making process. 2020, there was a case of Coffee's financial report falsification, which was due to the fact that LUCKIN Coffee's

financial report had been falsified, and the incident was due to the fact that LUCKIN Coffee's financial report had been falsified. In 2021, the famous real estate company EVERGRANDE Group also because of the expansion strategy error led to the capital chain break, that time, its chairman and CEO were the same person. After the incident, the two positions were taken by two people. The reorganization of the board of directors in these two cases implies that the structure and operation mode of the board of directors are closely related to the outcome of the company's decision-making.

China's commercial banking industry currently exists in the operating area is too centralized, facing the impact of the Internet financial challenges, insufficient supervision, and other issues, how to face the external performance of the competitive pressures at the same time to ensure the safety of the majority of depositors' funds is an important issue that it faces. Because of the ravages of the new crown epidemic, its impact on China's economic development in the past three years, and commercial banks as an important provider of funds to the economy, risk management need to pay more attention. Together with the aforementioned events of LUCKIN and EVERGRANDE, this paper inspires the motivation of this paper to study whether the composition of the board of directors of commercial banks has a moderating role in the relationship between the bank's operational risk and risk-taking level, therefore, this paper will take the commercial banks in China as the object of the study to empirically explore the relationship between the operational risk of the commercial banks in China and their risk-taking level, and to use the composition of the board of directors as a moderating variable to test its moderating effect. The board composition is also used as a moderating variable to test its moderating effect.

After collecting relevant literature, there is not much related literature in China for this area in the past five years, and most of the research topics are executive incentives, external regulation, and stock price changes, and the research methods of this literature include structural equations and nonlinear regression. The purpose of this paper is to investigate whether the board composition of commercial banks has a moderating effect on the relationship between bank operational risk and risk-taking level, and whether the main characteristics of the board composition are selected, including whether the chairman of the board of directors and the president of the bank are concurrently appointed, the size of the board of directors, and the proportion of independent directors, and the research method is the regression of the least-squares method, and the three moderating variables between the operational risk and the composition of the board of directors are designed to analyze the cross-sectional terms. The methodology is regression least squares, and the three moderating variables of business risk and board composition are analyzed with cross terms. The expected results of this paper can provide a practical reference value for the board composition of commercial banks in the future, as well as a reference for investors to make investment decisions.

2. LITERATURE REVIEW

2.1 Status and Responsibilities of the Board of Directors

The board of directors plays a central and crucial role in modern corporate governance, it is generated by the general meeting of shareholders in a company and is responsible for directing and managing the day-to-day business decisions of the entire company. Hou [4] suggests that the main responsibility of the board of directors is operational decision-making. Yu [5] pointed out that the board of directors is the core of corporate governance, which needs to supervise the management's business activities, has the function of providing consulting services for corporate strategy, and has the responsibility of supervising corporate tax payment behavior. According to the provisions of the Company Law of the People's Republic of China, the status and duties of the board of directors is a permanent organization of the company as well as a business executive organ, so it enjoys the right to execute business and make decisions on daily operations. Yu [5] points out that the board of directors is the core of corporate governance, which needs to supervise the management's business activities, has the function of providing consulting services for corporate strategy, and has the responsibility of supervising corporate tax behavior. Jiang [6] noted that the board of directors is bound to supervise and control the operators while providing incentive contracts for them.

2.2 Definition and Indicators of Bank Operational Risk

In the operation of commercial banks, there are different types of risks, which are mainly

categorized into credit risk, liquidity risk, and market risk. The author will introduce these risks that may occur in the operation in turn.

Credit risk. According to Xiao [7] credit risk is the possibility that a borrower or counterparty defaults on a loan due to a number of reasons, resulting in a loss to the financial institution. Chen et al. [8] pointed out that credit risk is the main risk faced by commercial banks in China. The main feature of the credit risk of finance companies is that the concentration is high but the overall risk is not large, the inability of the debtor to perform is the main reason for the credit risk of finance companies, and the debtor's malicious avoidance of repayment of loans is very rare.

Liquidity Risk. The study of Chen et al. [8] points out that the internal causes of liquidity risk are asset quality and structure factors, liability type, and structure factors, and asset-liability balance factors, and the external causes are the central bank's monetary policy factors, interest rate changes, and factors of the degree of development of the financial market. The liquidity risk of the finance company and the Group's own liquidity risk amplify each other. When the group's funds are tight, the finance company's sources of funds are greatly reduced, and it also faces a greater liquidity risk, which makes the group's liquidity risk amplified simultaneously.

Market risk. Xiao [7] pointed out in his study that market risk, on the other hand, refers to the possibility of a loss of the value of credit assets of financial institutions due to changes in market prices, such as stock prices, interest rates, exchange rates, and so on. Market risk mainly covers interest rate risk, exchange rate risk, stock market risk, and commodity price risk. In addition, the study of Chen et al. [8] pointed out that the market risk of finance companies, on the other hand, refers to the risk of changes in the price or value of derivatives due to unfavorable changes or sharp fluctuations in the market price of the underlying assets. The market price of the underlying assets includes changes in market interest rates, exchange rates, and stock and bond quotes, which may involve specific interbank business lines.

2.3 Research Related to the Risk of Bank Business

Credit risk, which is the risk of loss to the bank due to default of the bank's counterparty (e.g., a lender) and failure to repay the loan as scheduled, is the main risk faced by banks. Banks are an industry that manages risk and earns revenue through active risk-taking. In the study of Wu [9] it is shown that credit risk has the characteristics of uncertainty, transmission, and diffusion, as well as the characteristics of the sharp peaks and thick tails of the distribution of credit risk returns and the disability, difficult to quantify, the high level of difficulty in obtaining the risk data, and the obvious non-systematic characteristics.

Liquidity risk has an important impact on the sound operation of financial institutions and the stability of the financial system, and the lack of sufficient liquidity may cause financial institutions to fall into difficulties, and in serious cases, may lead to a liquidity crisis. The study by Ma and Li [10] by analyzing the impact of funding liquidity risk on bank risk components, found that the reduction of liquidity risk will improve profitability and reduce bank risk, but it also reduces the level of capital and increases bank risk, which in general is manifested in the increase of bank risk. The results show that large banks have higher overall stability and capital adequacy levels when liquidity risk is low, higher capital adequacy levels and lower financial intermediation risk for highly leveraged banks, lower asset risk and financial intermediation risk during financial crises, and higher capital adequacy levels and lower financial intermediation risk for banks during periods of high economic risk.

The effect of market risk on the level of bank risk-taking. Xiao's [7] study shows that in recent years, with the state's strong support for the development of the private economy, a large number of private and individual enterprises have emerged in the market. However, the current social and economic cycle is in a downward spiral, and the instability of the market economy has increased, leading to many business owners in the uneven quality of operation, poor operation, and other problems, which in turn led to the enterprise capital chain break, unable to repay the loan, and the overdue rate continues to climb. In addition, factors such as the marketization of loan interest rates in the country, the imperfect internal management mechanism of banks, the unclear division of responsibilities among personnel before, during, and after loans, and the inability of the bank's management system to support the needs of business development has also led to the increasing market risk of the industry, which in turn exacerbated the problem of delinquency. Therefore, this study concludes that banks need to be more cautious in loan

approvals and strengthen their vetting and risk assessment of borrowers. At the same time, banks should also establish a sound post-loan supervision mechanism to detect and deal with overdue loans in a timely manner to prevent risks. In addition, banks should also strengthen internal management, improve business processes, and improve service quality to enhance customer satisfaction and loyalty, so as to reduce the overdue rate of loans and safeguard the sound development of banks.

This paper deduces the first research hypothesis based on the above research as follows:

> **H1:** There is a positive and significant association between business risk (including credit risk, liquidity risk, and market risk) and risk-taking level.

2.4 Board Structure

Currently, in the academic world is more commonly studied board structure is divided into three, respectively, the chairman of the board of directors and the president of the board of directors, the size of the board of directors and the proportion of independent directors; its related to operational risk literature review is summarized as follows Its related to operational risk literature review is summarized as follows:

The concurrent appointment of chairman and president has a great impact on commercial banks' operations. Wang [11] states that the combination of two positions allows the chairman who initiates and executes strategic decisions to simultaneously assess the effectiveness of his strategic decisions, which gives the chairman more power base and control points. Zhang and Wan [12] pointed out that the separation of the two positions of chairman and president can effectively check and balance the personal power of the president and decentralize the leadership power, at this time, the decision-making of the commercial bank is the result of the compromise and compromise of the opinions of all parties, therefore, it can effectively reduce the operational risk and smooth the level of earnings. The integration of the two positions will greatly increase the work content of managers, so that managers not only have to complete the daily operation and management of the work, but also to coordinate the conflicts between shareholders, design the long-term development plan of the village bank, etc., but instead of lowering the efficiency of the work of the managers, and thus will increase the liquidity risk and operational risk in the process of commercial bank operations.

As far as the size of the board of directors is concerned, the size of its personnel is the main manifestation. The advantage of a larger number of people is that more external directors with very rich experience and knowledge can be hired to make up for the shortcomings of internal directors in terms of knowledge structure and experience. This ensures that board issues are fully discussed, reduces the company's business risks, and improves the accuracy of decision-making. However, the number of boards of directors should not be too large, otherwise, it will affect the efficiency of the board of directors. Niu [13] argues that there is a negative correlation between the size of the board of directors and the performance of enterprises or commercial banks. Zhang [14] pointed out that the number of board of directors plays a certain role in monitoring the enterprise, but the excessive number of board of directors brings more compensation costs so the enterprise has some "free-rider" behavior. When the number of board members is large, the company can obtain a lot of resources and contribute to the development and growth of the company reducing the role of management, and also reducing the possibility of the CEO directly controlling the board of directors, to promote the improvement of corporate performance, so as to reduce the bank's credit risk and market risk. Tan [15] pointed out that the size of the board of directors is too large to disorganize the functions of the board of directors, and the problem of internal "free-riding" hinders the responsibility of larger boards of directors to perform their duties, which in turn increases the probability of credit risk and market risk.

The proportion of independent directors has a significant positive effect on the economic performance of banks. Zhang [14] pointed out that independent directors are board members who are not involved with the management and other shareholders of the enterprise and are not responsible for any economic activities in the enterprise, and the power of independent directors does not affect the economic decisions of the management or the views of the shareholders' meeting on the development of the enterprise. The existence of independent directors can objectively give the enterprise the operation of their own views and suggestions, to help the management of the enterprise to calmly and objectively analyze the problem of independent directors in the field of law, finance

and business and other talents, but also can bring some help to the shareholders. This help can enable the shareholders' meeting and management to analyze the current situation of the enterprise and make relevant policies more rationally. Tan [15] pointed out that the social status and political and business relations of independent directors make them have non-affiliated resources and capabilities with the company, so through the resources of independent directors, it is easier for the company to maintain the relationship with the regulatory authorities or other business partners in the process of operation, which reduces the company's business risks. The second research hypothesis of this paper can be summarized from the above literature:

> **H2:** Board structure (including whether the chairman of the board and the president of the bank are concurrently appointed, the size of the board of directors, and the percentage of independent directors) has a significant effect on operational risk.

2.5 The Impact of Board Structure on Risk-Taking Capacity

In this paragraph, we will study the impact of three main components of board structure characteristics, namely, the presence or absence of concurrent chairmanship with the president of the bank, the size of the board of directors, and the percentage of independent directors on the bank's ability to take the level of risk.

Whether the chairman of the board has a concurrent position with the president of the bank. If the chairman of the board of directors and the president of the bank are concurrent, it means that the chairman of the board of directors of the commercial bank also holds the position of the president of the commercial bank, and this situation is the combination of the two positions. Molz [16] argues that the combination of the chairman of the board of directors and the general manager of the board of directors can impair the independence of the board of directors, because under the combination of the two positions, the chairman of the board of directors is the general manager of the enterprise, and out of the pressure of their own performance or other considerations, the chairman of the board and the general manager of the board of directors may not be objective and impartial. Because the chairman of the board is the general manager of the enterprise, due to the pressure of his own performance or other considerations, the chairman and general manager may not be able to objectively and impartially manage and supervise the work of the enterprise, and there is uncertainty about their independence. Rechner & Dan [17] selected a sample of 1978-1983 US 141 Fortune 500 firms whose leadership structure remained unchanged for the study, and the empirical results showed that the performance of firms with two separate positions was significantly better than the performance of firms with two combined positions. (2) Based on the stewardship theory and the "rational economic man" hypothesis, due to managers' own intrinsic drive to gain recognition and establish authority through their work, the two-job separation will improve decision-making efficiency. (3) Based on the environmental dependence theory, the choice of two-job integration or two-job separation depends only on the external environment faced by the enterprise. The empirical study of Cai and Wu [18] also provides support for the viewpoint of principal-agent theory that firms with two jobs are more likely to have violations and the degree of violation tends to be more serious.

Board size is an important factor that affects the functioning of the board of directors, which in turn affects corporate risk-taking. Cai and Wu [18] showed that there is a significant positive correlation between the size of the board of directors of a listed company and its non-compliance and that the larger the board size, the more likely the company is to commit non-compliance. Tan [15] suggests that a large board decision-making team will have difficulty in reaching a unified decision-making opinion within the meeting, especially for relatively aggressive expansion strategies, for example, it is more difficult to obtain the approval of all members. It also, therefore, makes it more likely that firms will adopt non-extreme moderate decisions and thus abandon risky projects. To some extent, a larger board size can act as a disincentive to firm risk-taking. Liang and Liu [19] empirically examine corporate governance and credit risk in commercial banks using data from 16 listed commercial banks from 2008 to 2011. The article found that the larger the size of the board of directors, on the one hand, the efficiency of communication and coordination among directors decreases, and on the other hand, the influence of shareholders on the board of directors' decision-making increases, and thus the bank's credit risk increases. At the same time, however, there are scholars who believe that there is no significant correlation between the size of the

board of directors and the level of risk-taking of commercial banks. For example, Zhuang et al. [20] use the semi-annual data of 13 listed commercial banks in China from 2001 to 2012 to empirically examine the behavior of bank governance and risk-taking using an unbalanced panel model and find that the board size does not have a significant impact on the bank's risk-taking.

In China's banking industry, the independent director system plays an important role. Due to the relatively low level of internal governance in China's commercial banks, independent directors enter the board of directors as an independent third party, which avoids the problem of insider control and enables them to better perform their supervisory duties to monitor the board directors and the bank managers. The study of Fama & Jensen [21] emphasizes even more on the role of the independent directors, and they suggest that the independent directors, in the course of the corporate governance, can supervise the misplaced decisions made by managers in seeking to maximize their own interests, as well as managers of internal agencies and their associated behaviors, which can serve to reduce agency costs. Guan and Deng [22] conducted a regression analysis of the relationship between these two aspects of board structure and corporate risk-taking by using profitability volatility as a proxy variable for measuring corporate risk-taking and found that the size of the board of directors is significantly negatively correlated with corporate risk-taking and the proportion of independent directors is significantly negatively correlated with corporate risk-taking, and both hypotheses were verified. The establishment of a standardized and efficient board of directors is the key to building a modern corporate governance structure. Reasonable and effective board structure can help to improve the level of corporate governance and corporate risk-taking ability, thus enhancing the value of the enterprise. Therefore, enterprises should set a reasonable size of the board of directors to avoid the occurrence of group risk avoidance behavior due to the large size of the board of directors. At the same time, the proportion of independent directors should be increased while setting a reasonable board size, which can effectively promote the company to choose reasonable investment opportunities and projects, enhance the company's ability to bear risks, improve the level of risk-taking, and thus improve the company's core competitiveness and company value. Cao and Zhu [23] examined how bank governance affects the risk-taking channel of monetary policy transmission by using data from 105 Chinese commercial banks from 2003-2010, and the results showed that board independence is significantly negatively related to bank risk measured by the non-performing loan ratio. Cao [24] empirically examines the impact of governance mechanisms on the risk-taking behavior of state-owned and joint-stock commercial banks after collecting data from these two types of commercial banks for 2004-2007. The results show that the independence of the board of directors has a certain impact on reducing bank risk. Based on the above literature, the third research hypothesis of this paper is summarized as follows:

> **H3:** Board composition (including whether the chairman of the board of directors and the president of the bank are concurrently appointed, the board size, and the percentage of independent directors) has a significant effect on the level of risk-taking.

3. METHODOLOGY

Our research hypotheses were summarized based on the literature review: 1) There is a significant association between business risk and risk-taking level. 2) Board structure has a significant effect on operational risk. 3) Board structure has a significant effect on the level of risk-taking. 4) Board structure has a moderating effect between operational risk and risk-taking level. This paper plots the association between bank operational risk, board structure, and bank risk-taking level as shown in Fig. 1, and uses this research model as the basis for the research design.

This paper takes Chinese commercial banks as the research sample from 2017 to 2021 to explore the relationship between bank operational risk, board structure, and bank risk-taking level, and to test whether board structure has a moderating effect between bank business risk and risk-taking level. All the samples are intercepted from the database of CSMAR, and after all the samples are downloaded, the samples with incomplete information are firstly deleted, and then the extreme values are removed, so that the total number of samples obtained is 730. The research method is the Ordinary Least Squares (OLS) method and the regression model is presented below:

$$RISKT_{it} = \alpha_0 + \alpha_1 NPL_{it} + \alpha_2 SDT_{it} + \alpha_3 NPL * SDT_{it} + \alpha_4 BSIZE_{it} + \alpha_5 NPL * BSIZE_{it} + \alpha_6 INDEP_{it} + \alpha_7 NPL * INDEP_{it} + \alpha_8 CAP_{it} + \alpha_9 BIGST_{it} + \alpha_{10} AGE_{it} + \alpha_{11} SCALE_{it} + \varepsilon_{it} \quad (1)$$

$$RISKT_{it} = \alpha_0 + \alpha_1 LIQ_{it} + \alpha_2 SDT_{it} + \alpha_3 LIQ * SDT_{it} + \alpha_4 BSIZE_{it} + \alpha_5 LIQ * BSIZE_{it} + \alpha_6 INDEP_{it} + \alpha_7 LIQ * INDEP_{it} + \alpha_8 CAP_{it} + \alpha_9 BIGST_{it} + \alpha_{10} AGE_{it} + \alpha_{11} SCALE_{it} + \varepsilon_{it} \quad (2)$$

$$RISKT_{it} = \alpha_0 + \alpha_1 RC_{it} + \alpha_2 SDT_{it} + \alpha_3 RC * SDT_{it} + \alpha_4 BSIZE_{it} + \alpha_5 RC * BSIZE_{it} + \alpha_6 INDEP_{it} + \alpha_7 RC * INDEP_{it} + \alpha_8 CAP_{it} + \alpha_9 BIGST_{it} + \alpha_{10} AGE_{it} + \alpha_{11} SCALE_{it} + \varepsilon_{it} \quad (3)$$

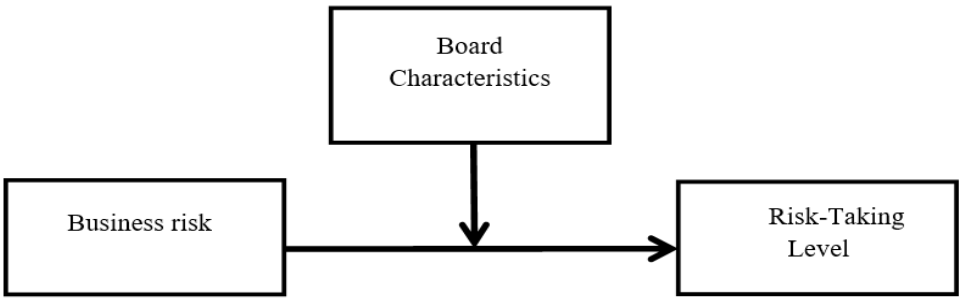

Fig. 1. Correlation between bank business risk, board characteristics, and bank risk-taking level

3.1 Description of Variables

3.1.1 Explained variables

The explanatory variable selected in this paper is the level of risk-taking (RISKT). The main measures of risk-taking level are the volatility of earnings, the probability of firm survival expenses, and capital expenditures. Since higher risk-taking implies an increase in the uncertainty of future cash flows the volatility of corporate earnings is most widely used to measure risk-taking. Therefore, in this paper, we adopt the study of Yu et al. [25] and measure the level of risk-taking by the volatility of earnings, which is the ratio of EBITDA to total assets at the end of the year. To calculate the volatility, we first adjust for the industry average of commercial banks in each year and then calculate the industry-adjusted standard deviation of commercial banks in each observation period. The formula is:

$$RISKT_{it} = \sqrt{\frac{1}{N-1}\sum_{n=1}^{N}\left(ADJ\_ROA_{in} - \frac{1}{N}\sum_{n=1}^{N} ADJ\_ROA_{in}\right)^2} \ / N=3,$$

Where $ADJ\_ROA_{in} = \frac{EBITDA_{in}}{ASSETS_{in}} - \frac{1}{X_n}\sum_{k=1}^{x}\frac{EBITDA_{in}}{ASSETS_{in}}$

3.1.2 Explanatory variables

This paper selects one indicator from credit risk, liquidity risk and market risk as a proxy variable for operational risk, which are described as follows:

Non-performing loan ratio (NPL): Referring to the study of Shi [26] if the proportion of loans with bad credit is too large, it indicates that the bank's asset quality and the control of operational risk are poor, so this paper selects the NPL ratio as a proxy variable for the bank's credit risk. Furthermore, referring to the study of Guo [27] it can be obtained that the non-performing loan ratio (NPL) = non-performing loan balance/total loans × 100% = (substandard loans + doubtful loans + loss loans)/all loans × 100%.

Current ratio (LIQ): According to Dai et al., [28] the current ratio is the most commonly used ratio to measure the short-term debt solvency of a company, and it is also an important indicator of short-term risk. The current ratio can show a company's market liquidity and ability to meet the requirements of creditors. Therefore, this paper selects the current ratio as a proxy variable for bank liquidity risk.

Revenue cost ratio (RC): The revenue cost ratio is the ratio of the total of all revenues of business operations to the total costs, which reflects the proportional relationship between business revenues and business consumption, i.e. the number of costs consumed by a certain amount of revenues. Therefore, this paper selects the cost of revenue ratio as a proxy variable for bank market risk.

3.1.3 Moderating variables

This paper takes board structure characteristics as the moderating variable and selects whether the chairman of the board and the president of the bank are concurrently appointed, the size of the board of directors, and the proportion of independent directors as the proxy variables for board structure characteristics, and these three moderating variables, in addition to being set as separate variables, are also processed separately with the explanatory variables in a cross-terms process in order to test whether there is a moderating effect. The way the variables are calculated is explained separately as follows:

Chairman and governor concurrently (SDT): to determine whether the chairman and governor are the same person, this is a dummy variable, if the chairman and governor are not the same person is set to 1; if not, it is set to 0.

Board size (BSIZE): based on the total number of board members. Independent Director Percentage (INDEP): Calculated as the ratio of the total number of independent directors to the total number of directors on the board of directors.

3.1.4 Control variables

Capital adequacy ratio (CAP): Capital adequacy ratio, also known as capital risk-weighted asset ratio, is the ratio of a bank's total capital to its risk-weighted assets. Referring to Li and Tao [29] it is pointed out that the capital adequacy ratio, as a core indicator for monitoring risk in commercial banks, can fully reflect the relationship between own capital and risk-taking. Although asset securitization started late in China, it has played a significant role in revitalizing non-current assets, increasing bank profitability, and improving bank financing structure, which has injected vitality into the development of commercial banks and improved their capital adequacy ratios so as to satisfy the minimum capital requirements stipulated by the regulation.

Shareholding ratio of the first largest shareholder (BIGST): Referring to the study of Feng [30] ensuring the percentage of shareholding of the first largest shareholder of a company so that it can make major decisions independently and without interference is key to ensuring improved corporate governance performance. A highly centralized shareholding structure is reflected in the early stages of firm growth as being able to enable firms to achieve a higher rate of return in the short term. Based on the fact that the largest shareholder of a bank is usually the founder and the beneficial owner of the bank if the shareholding ratio is larger, the largest shareholder will pay more attention to the financial performance of the bank and actively participate in the operation of the bank for their own interests, which will have a better effect on the financial performance of the bank, therefore, this paper lists the proportion of the first largest shareholder's shareholding as one of the control variables.

Age of the bank (AGE): Coad et al. [31] pointed out that the age of the company is related to the performance of the company, that the profitability and productivity of the company will change differently with different age stages, so this paper adopts the age of the bank as one of the control variables. Bank age is measured from the date of establishment of the bank to the end of the study year to which it belongs.

Bank size (SCALE): Referring to the study of Huang [32] the existence and growth of commercial banks are anchored on assets. Total assets are generally used to measure the size of the bank. Assets are resources formed by past transactions or events of a firm, owned or controlled by the firm, and provide some economic benefit to the firm in the future. As the larger the size of the bank, the greater the advantage of economies of scale and greater control of risk and resources, then the bank's financial performance will also bring a considerable degree of impact. Therefore, this paper uses the total assets of the sample company as a proxy variable for bank size and takes the natural logarithm in order to minimize the absolute difference between this variable and the other variables without affecting the relative relationship.

4. RESULTS AND DISCUSSION

Before conducting the empirical analysis, a comprehensive review of the overall sample was conducted in order to understand the distribution and gaps in the sample, including the various aspects of the industry's business performance indicators, size and board of directors, and so on.

The effective sample size from 2017 to 2021 is 730. Table 1 shows that the risk-taking level of the overall sample firms varies as much as five times; the distribution ranges of non-performing loan ratios, liquidity risk and cost of income ratios are also far apart, indicating that the risk management capabilities of individual banks vary

greatly. As for the structure of the board of directors, the separation of the positions of chairman and president is very common, with a mean value of 0.982, indicating that the banks generally have the concept of supervision and constraints in management. The size of the board of directors' meets the minimum number of directors required by the Company Law, and the larger the bank, the larger the board of directors will be. As for the proportion of independent directors, although the "Corporate Governance Guidelines for Banks and Insurance Institutions" of 2021 states that the independent directors of banks and insurance institutions shall not be less than one-third of the board of directors in principle, the "Corporate Governance Guidelines for Commercial Banks" issued in 2013 did not stipulate the number or proportion of independent directors before 2021, so some banks have not yet set up independent directors. Therefore, there are still some banks that do not have independent directors. The rest of the variables, such as bank size, the percentage of shares held by the largest shareholder, bank age, and capital adequacy ratio, show that there are significant differences among the banks in the sample.

Next, Tables 2 to 4 show the empirical results of the OLS and analyze the results. Before analyzing, we make a preliminary judgment on the reasonableness of the linear regression model design. First of all, we review the Durbin-Watson value, which is suitable for checking whether the residuals are self-correlated or not, and the Durbin-Watson values of Tables 2 to 4 range from 1.069 to 1.124, which is still within a reasonable range. Next, the statistical explanatory power indicator, i.e., the adjusted R-squared, is examined. The adjusted R-squared values in Tables 2 to 4 range from 0.322 to 0.345, which is within a reasonable range in the field of social sciences. Finally, the F-value, which is the statistic of the F test, that is, whether the variance between the variables is significant, if it is significant, it also indicates that the regression is predictive, and the F-values in Tables 2 to 4 are all significant, which indicates that the regression design in this paper is predictive. Next, Tables 2 to 4 are the analytical description of the empirical results.

Table 2 shows that there is no significant association between non-performing loan ratio (NPL), separation of the two positions of chairman and president (SDT), size of the board of directors (BSIZE) and percentage of independent directors (INDEP), as well as non-performing loan ratio and the cross terms of the other three (NPL*SDT, NPL*BSIZE, and NPL*INDEP), on the level of risk-taking of the bank.

Table 1. Descriptive statistics (N=730)

Variable	Min.	Max.	Ave.	Std.
RISKT	0.000	0.005	0.001	0.001
NPL	0.000	0.064	0.013	0.011
LIQ	0.000	160.200	60.237	30.069
RC	-30.576	50.954	2.158	8.372
SDT	0.000	1.000	0.982	0.132
NPL*SDT	-0.002	0.097	0.001	0.014
LIQ* SDT	-1.726	30.257	-0.141	3.795
RC* SDT	-0.768	1.539	-0.016	0.243
BSIZE	5.000	19.000	11.895	2.912
NPL*BSIZE	-0.634	0.682	0.000	0.261
LIQ*BSIZE	-400.461	293.723	-16.738	129.436
RC*BSIZE	-109.917	69.623	-0.050	18.469
INDEP	0.000	0.467	0.263	0.121
NPL*INDEP	-0.019	0.026	0.000	0.011
LIQ*INDEP	-19.173	15.004	-0.673	5.914
RC*INDEP	-3.847	4.724	0.025	0.896
CAP	0.109	0.380	0.147	0.037
BIGST	0.000	1.000	0.226	0.248
AGE	6.019	65.353	17.963	9.115
SCALE	0.000	30.934	18.673	12.154

Note: For the codes of each variable, please refer to the variable descriptions in 3 Methodology.

Table 2. Empirical results of model (1) (N=730)

Variable Code	Coefficient	t	p
Con_	0.000	0.318	0.750
NPL	0.002	0.474	0.635
SDT	0.000	-0.314	0.754
NPL*SDT	-0.002	-0.235	0.814
BSIZE	0.000	0.168	0.867
NPL*BSIZE	0.001	1.260	0.208
INDEP	0.001	0.853	0.394
NPL*INDEP	0.025	1.534	0.126
CAP	0.006	6.011	0.000***
BIGST	0.001	4.510	0.000***
AGE	0.000	-3.888	0.000***
SCALE	0.000	-5.202	0.000***
Adj_R sq.	0.322	Durbin-Watson	1.082
F value	32.522***		

Note 1: For the codes of each variable, please refer to the variable descriptions in 3 Methodology.
*Note 2: Significance is *** when p<=0.01, ** when 0.01<p<=0.05, and * when 0.05<p<=0.1.*

Table 3. Empirical results of model (2) (N=730)

Variable Code	Coefficient	t	p
Con_	0.001	1.855	0.064*
LIQ	0.000	-2.984	0.003***
SDT	0.001	2.909	0.004***
LIQ*SDT	0.000	3.719	0.000***
BSIZE	0.000	-4.870	0.000***
LIQ *BSIZE	0.000	-2.759	0.006***
INDEP	0.000	-0.969	0.333
LIQ *INDEP	0.000	1.982	0.048**
CAP	0.005	4.587	0.000***
BIGST	0.001	4.403	0.000***
AGE	0.000	-3.988	0.000***
SCALE	0.000	-4.983	0.000***
Adj_R sq.	0.345	Durbin-Watson	1.124
F value	35.963***		

Note 1: For the codes of each variable, please refer to the variable descriptions in 3 Methodology.
*Note 2: Significance is *** when p<=0.01, ** when 0.01<p<=0.05, and * when 0.05<p<=0.1.*

Table 4. Empirical results of model (3) (N=811)

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Variable Code	Coefficient	t	p
Con_	0.001	2.301	0.022**
RC	0.000	-1.916	0.056*
SDT	0.000	0.239	0.811
RC *SDT	0.000	1.569	0.117
BSIZE	0.000	-3.629	0.000***
RC *BSIZE	0.000	-0.877	0.381
INDEP	-0.001	-1.998	0.046**
RC *INDEP	0.000	0.835	0.404
CAP	0.008	7.293	0.000***
BIGST	0.001	4.855	0.000***
AGE	0.000	-3.578	0.000***
SCALE	0.000	-5.848	0.000***
Adj_R sq.	0.313	Durbin-Watson	1.069

F value	34.516***

Note 1: For the codes of each variable, please refer to the variable descriptions in 3 Methodology.
*Note 2: Significance is *** when p<=0.01, ** when 0.01<p<=0.05, and * when 0.05<p<=0.1.*

As can be seen in Table 3, liquidity ratio (LIQ), board size (BSIZE), cross term of liquidity ratio with board size (LIQ *BSIZE) and level of risk taking show a negative and significant association, while separation of the two positions of chairman and president (SDT), cross term of liquidity ratio with separation of the two positions of chairman and president (LIQ *SDT), cross term of liquidity ratio with the percentage of independent directors (LIQ *INDEP) and level of risk taking show a positive and significant association. term (LIQ *INDEP) and the level of risk taking show a positive and significant association. This result also indicates that the greater the liquidity is, the more it can mitigate the impact of operational risk, and the larger the board of directors is, the more it can help the bank to formulate a risk response strategy, however, although the joint effect of the two can also mitigate the impact of operational risk, we can see that the T-value in the cross-tabulation of the two is slightly larger than that of the two variables individually, which indicates that when the bank is more liquid, the directors' decisions may be less likely to be made in the same way. This is an area of particular concern as directors may not be as disciplined in their decision making. The positive and significant effect of the separation of the positions of chairman and president on the level of bank risk-taking suggests that the current prevalence of the separation of the two positions in banks rather raises operational risk, indicating that the communication between the board of directors and the management is poor, which is an area that needs to be strengthened in the corporate governance of the bank; secondly, the cross term of the liquidity ratio with the separation of the positions of the chairman and the president also raises the operational risk of the bank, showing that under higher liquidity ratios the Secondly, the intersection of liquidity ratio and the separation of chairman and president also increases the bank's operational risk, showing that under the higher liquidity ratio, the separation of powers does not bring better operational results for the bank, indicating that the board of directors' decision-making may not have a deep enough understanding of the operational situation to formulate the most appropriate operational decisions; and lastly, the intersection of the liquidity ratio and the percentage of independent directors also raises the level of the bank's risk-bearing, indicating that under the higher liquidity ratio, the higher the percentage of independent directors, but the higher operational risk the bank faces. This is related to the lack of substantial independence of independent directors that is common in China, because if independent directors do not have substantial independence, then they cannot make business recommendations for the company from a transcendent and independent position, and they may be appointed even if they do not have the appropriate professional knowledge, which is an issue that should be of special concern for the current bank operations.

Table 4 shows that there is a negative and significant relationship between Revenue Cost Ratio (RC), Board Size (BSIZE), and Independent Directors' Percentage (INDEP) and Risk Taking Level, however, there is no significant effect of cross terms in the variables. It means that lower costs, a larger board size, and a higher percentage of independent directors can help to reduce the level of risk-taking of the bank, but when the cost-to-income ratio is higher, a larger board size and a higher percentage of independent directors cannot provide better advice on the operation of the bank, which means that the expertise of the board members, whether independent or non-independent, is not enough to provide better advice on the operation of the bank. This is also a key point that banks should demand more professionalism from their board members.

5. CONCLUSION

Using Chinese commercial banks as a research sample from 2017 to 2021, this paper uses the least squares method of regression to explore the relationship between bank operational risk, board structure characteristics (whether the chairman and president are concurrently in office, board size, and the percentage of independent directors) and bank risk-taking level, and to test whether there is a moderating effect of board structure between bank operational risk and risk-taking level. The findings of the study are summarized as. It is found that the current ratio and cost of income ratio have a significant negative correlation effect on the level of risk-taking in commercial banks. Whereas non-performing loan ratio has no significant effect on the level of risk-taking in commercial banks. The size of the board of directors has a negative

moderating effect on the relationship between the liquidity ratio and the level of risk-taking, which means that the larger the size of the board of directors, the more it can help to reduce the impact of the liquidity ratio on the level of risk-taking in commercial banks. Separation of the positions of chairman and president in the relationship between the liquidity ratio and the level of risk-taking, according to a positive moderating effect, that is to say, the chairman of the board of directors and the president of the board of directors, if different people, can increase the liquidity ratio of the impact of poor risk-taking level of commercial banks. For market risk, although the proportion of independent directors has a negative and significant effect on the level of risk-taking, in the cross-term income-cost ratio the proportion of independent directors has no significant effect on the level of risk-taking. On the basis of the above findings, this paper puts forward the following recommendations:

1. due to the bank's internal control is generally stricter than the general industry, the current domestic banks of non-performing loan rate is also low, so credit risk for the current level of bank risk-bearing did not cause a significant impact, and the liquidity ratio and the cost of income ratio on behalf of the commercial banks of the financial structure of the situation and the profitability of the situation, illustrates the commercial banks of the overall financial stability, so the commercial banks should pay attention to their own financial ratio, and operational review of the cross term of independent directors. Therefore, commercial banks should pay attention to their financial ratios and review their operations to identify risks in a timely manner. Investors should also pay special attention to changes in financial ratios when choosing investment targets.
2. The larger the size of the board of directors, the lower the bank's risk-taking level. Therefore, it is suggested that commercial banks should try to recruit directors with professional ability to participate in the operation, so as to provide the bank with more rigorous and comprehensive decision-making and reduce the risk-taking level.
3. The fact that the chairman of the board of directors and the president of the bank are not the same person increases the level of risk-taking of the bank, indicating that the communication between the chairman of the board of directors and the president of the bank is ineffective. In the spirit of corporate governance, the separation of the two positions is for the purpose of checks and balances and supervision, but if the separation of the two positions is accompanied by poor communication, it is also a great risk for the bank's operation, and it is suggested that the president and the board of directors of a bank should strengthen the communication mechanism to make the decisions of the board of directors implemented in full. Therefore, it is suggested that the bank president and the board of directors should strengthen the communication mechanism in order to make the decisions of the board of directors to be implemented completely.
4. The proportion of independent directors does not play a moderating role between the market risk and the level of risk-taking, indicating that independent directors are not very familiar with the risks and business model of the market environment in which the bank operates. Therefore, it is recommended that commercial banks should pay more attention to the practical experience of the candidates in the banking industry when selecting the independent directors, instead of just emphasizing on the academic qualifications or other areas of reputation and other resources.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sahin A. Money, Banking and Economic Growth, Nobel Publications, September, 1st ed. Ankara, Turkey; 2021.
2. Şahin A. The Effects of the Confidence in the US Banking Sector to the Economic Growth: An Application of the Smooth Local Projections Method for Estimating Impulse Responses. Journal of Applied Economics and Business Research. 2022 ;12(1):1-9.
3. Ma Lf. Corporate Governance (third edition). China Renmin University Press. Beijing; 2022.
4. Hou L. Research on the Problems and Countermeasures of the Construction of Board of Directors of State-owned

Construction Enterprises. Enterprise Reform and Management. 2023;03:3-5. DOI:10.13768/j.cnki.cn11-3793/f.2023.0121
5. Yu X. Board of Directors, Internal Control Quality and Corporate Tax Avoidance. Southwestern University of Finance and Economics; 2022. DOI:10.27412/d.cnki.gxncu.2020.001020.
6. Jiang X. An Analysis of the Impact of Friendly Boards of Directors on Corporate Governance. Modern Management Science .2011;05:53-55.
7. Xiao J. Research on Agriculture-related Loans' Risk Management of CQPSB. Southwestern University of Finance and Economics; 2022. DOI:10.27412/d.cnki.gxncu.2021.003022
8. Chen X, Sun C, Xu G. Exploration and Practice of Financial Risk Prevention and Control in Finance Companies--Based on Risk Management Practice of Shenhua Finance Company. Coal Economic Research. 2018;38(05):41-45. DOI:10.13202/j.cnki.cer.2018.05.006
9. Wu Z. An Empirical Study on Credit Risk Measurement of Listed Companies. Wuhan University of Technology. Master Thesis; 2012. DOI:10.7666/d.y2099033
10. Ma Y, Li Z. Funding Liquidity and Bank Risk-taking: Empirical Evidence from China. Finance & Trade Economics. 2019;40(0):67-81.
11. Wang Q. Dual office and board dissent: An Empirical Study Based on Listed Companies. Modern Management Science .2023;(01):62-75.
12. Zhang Y, Wan A. Leadership structure of village bank boards of directors: two positions in one or two separate positions? --An empirical analysis based on return and risk perspectives. Wuhan Finance. 2021;09:41-48.
13. Niu L. Board Size, Independence and Firm Performance - An Empirical Study Based on Listed Family Firms in China. Southwestern University of Finance and Economics; 2022.
14. Zhang S. Shareholding Structure, Board Characteristics and Firm Performance. JiLin University of Finance and Economics; 2022.
15. Tan S. The Impact of Board Characteristics on Risk Taking in Chinese Commercial Banks. Shanghai University of Finance and Economics; 2022. DOI:10.27296/d.cnki.gshcu.2020.001637
16. Molz R. Managerial domination of boards of directors and financial performance. Journal of Business Research. 1988;16(3):235-249.
17. Rechner PL, Dalton DR. Corporate board composition and capital structure: An empirical assessment. Journal of Managerial Issues. 1991;427-444.[18]
18. Liang H, Liu Y. Corporate Governance and Credit Risk in Commercial Banks: An Empirical Study Based on Listed Banks. Finance and Economy .2012;10:75-78. DOI:10.19622/j.cnki.cn36-1005/f.2012.10.020
19. Zhuang Y, Zhu J, Sun Y. Corporate Governance and Bank Risk-Taking Behavior--A Study Based on Listed Commercial Banks in China. Economy and Management .2013;27(10):34-38.
20. Fama EF, Jensen MC. Separation of ownership and control. The journal of law and Economics. 1983;26(2):301-325.
21. Guan B, Deng R. An empirical study of the relationship between board structure characteristics and corporate risk-taking. Modern Management Science. 2015;01:9-11.
22. Cao T, Zhu B. Monetary Policy, Bank Governance and Risk-Taking. Finance Forum. 2012; 17(12):4-12. DOI:10.16529/j.cnki.11-4613/f.2012.12.003
23. Cao Y. The Impact of Governance Mechanisms on Risk-Taking Behavior in State-Owned Commercial Banks. Shandong Social Sciences. 2009;5:85-87. DOI:10.14112/j.cnki.37-1053/c.2009.05.036
24. Cai Z, Wu S. The Empirical Study on Behavior of Committing Fraud in Listed Companies: Evidence from the Characteristics of Board of Directors.. Nankai Business Review. 2007;06: 62-68-92.
25. Yu M, Li W, Pan H. Managerial Overconfidence and Corporate Risk Taking. Journal of Financial Research .2013; 01:149-163.
26. Shi J. An empirical study of commercial banks' "deleveraging" and business performance. Times Finance. 2019;16:77-80+83.
27. Guo M. A research on the impact of risk-taking on the stock price and its volatility of listed Banks in China. Hunan University; 2022.
28. Dai Z, Huang T, Yang H. An empirical analysis of the impact of interest rate marketization on liquidity risk of listed

commercial banks. Social Sciences in Xinjiang. 2015;03:22-27+169.
29. Li H, Tao Y. The Influence of Asset Securitization on Bank Capital Adequacy Ratio and Non-performing Loan Ratio. Exploration of Financial Theory. 2023;03:38-49. DOI:10.16620/j.cnki.jrjy.2023.03.004
30. Feng J. An Empirical Study on the Impact of SMEs' Capital Structure on Corporate Governance Performance--Taking the GEM as an Example. Financial Management Research. 2022;11:78-82.
31. Coad A, Segarra A, Teruel M. Like milk or wine: Does firm performance improve with age? Structural Change and Economic Dynamics .2013;24:173-189.
32. Wang Q. A study of the effect of commercial bank size on the credit transmission channel of monetary policy. China Economic Review .2022;(12).