The Moderating Role of Corporate Governance between FinTech and Sustainable Development – The Case of Chinese Listed Companies in the Financial Industry

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Abstract

Based on the trend of Fintech development, this paper selects the Chinese listed companies in financial industry from 2011 to 2022 as the sample, and takes the empirical method to explore the correlation between corporate governance, the Fintech transformation degree and the enterprises' development capability, and conducts a lagged test. It is found that the degree of transformation of big data, Blockchain, AI, and cloud computing will have a negatively significant impact on the enterprises' development capabilities during the current period. The corporate governance performance with high ownership concentration will show a positively significant moderating effect between the degree of cloud computing transformation and the firms' development capability in the current and lagged one period. Furthermore, corporate governance performance will show a positively significant moderating effect between the degree of big data and AI transformation and the firms' development capability in the lagged one period. This paper also provides recommendations based on the findings.

Keywords: Fintech, Corporate Governance, Development Capability

JEL Classifications: D92, G30, M15

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1. Introduction

With the continuous development of Fintech, in China, most domestic financial institutions are actively exploring and accelerating the application of Fintech, led by Blockchain, big data, artificial intelligence, and cloud computing, to their business and risk management (Yu, 2019). In the financial industry, Fintech has had a huge impact on various financial business. Fintech has not only changed the traditional business model of banks, but also enhanced service efficiency, lowered operating costs, improved user experience, and even created a completely new business model based on the original. However, not all of the financial industry's investment in Fintech has yielded ideal returns. For example, CROWDLOAN, a P2P online lending platform, that declared bankruptcy in 2013 after only one month online, failed to operate due to the inexperience of the entire management team. The failure case also highlights the fact that the financial industry's investment in Fintech involves a comprehensive corporate strategy. Therefore, the success or failure of the results of the investment in Fintech, and the corporate governance performance is of great significance.

Based on the above background, this paper is inspired to explore the relationship between corporate governance, the degree of Fintech transformation, and the development capability of enterprises, as well as the moderating effect of corporate governance between the degree of Fintech transformation and the development capability of enterprises. So far, we have not found any literature that discusses the overall relationship between corporate governance, the degree of Fintech transformation and the development capability of enterprises. However, the transformation of Fintech involves corporate strategy, so in the process of transformation, the performance of corporate governance has a pivotal impact, it is necessary to explore the moderating role of corporate governance in the degree of transformation of Fintech and the development capacity of enterprises is of great importance and substantial significance. Therefore, this paper will use empirical methods to explore the moderating effect of corporate governance on the different technicals of Fintech and the impact on the development capability of enterprises, and further explore whether there is a lagging effect between the degree of transformation of corporate governance and Fintech on the development capability of enterprises. It is expected that the research findings can provide a substantial reference for the implementation strategies of enterprises in Fintech and the impact of corporate governance on Fintech investment, as well as provide new theoretical perspectives for researchers in the field of corporate governance and Fintech. In the subsequent chapters of this paper, we will first collect the relevant literature for generalization and put forward the hypotheses, then design the appropriate methodology according to the hypotheses, and finally put forward the corresponding recommendations through the empirical results.

2. Literature Review

2.1 Corporate governance

Corporate governance is defined as a mechanism of supervision and checks and balances between owners and operators, the goal is to maximize the interests of shareholders by rationally

configuring the relationship of power and responsibility between owners and operators, the corporate governance structure mainly consists of the general meeting of shareholders, the board of directors and high-level managers (Ma, 2022). The Organization for Economic Co-operation and Development (OECD) first published the principles of corporate governance in 1999, which were revised in 2023 and endorsed by the leaders of the Group of 20 (G20).

At present, the more widely used corporate governance evaluation system in the world is mostly based on the OECD Corporate Governance Guidelines as the standard for the design of evaluation indexes, which mainly includes the governance service system of the Standard & Poor's, DEMINOR's Corporate Governance Evaluation System, and the Corporate Governance Evaluation System of CLSA Asia-Pacific Markets, among others. In China, there is the "China Listed Company Board Governance Evaluation Indicator System" launched by Beijing LIANCHENG International Financial Consulting Company in 2002, but the evaluation indicators are not yet comprehensive; the "China Listed Company Governance Evaluation Indicator System (CCGINK)" proposed by the Center for Corporate Governance Studies of NANKAI University in 2003 is a more systematic evaluation system, but the evaluation system does not involve CSR indicators, so there is still room for discussion. However, the evaluation system does not involve CSR indicators, so there is still room for discussion. Due to the small number of evaluation targets and the fact that the detailed evaluation indexes of the above domestic and foreign evaluation systems are not publicly announced, academics are unable to obtain sufficient samples for corporate governance research. In this regard, some scholars have developed other evaluation methods that can be computed from the public information of listed companies in the form of corporate governance evaluation models, for example, the corporate governance evaluation model designed by Young and Wu (2009), which categorizes corporate governance into the two levels of shareholding and board of directors structure. Considering the convenience of obtaining samples, this paper adopts this model as a proxy variable for corporate governance, and the calculation approach will be introduced in the methodology section.

2.2 Fintech

The Financial Stability Board (FSB) defined it for the first time as innovative technologies in financial services that may result in new business models, applications, processes, or products and associated material impact on the delivery of financial services (FSB, 2017a). Quarles (2019), Vice-Chairman of the committee, stated in a joint meeting with the European Central Bank and the Journal of Money, Credit and Banking, that Fintech is broadly defined as technology-driven financial innovation. The main types of technology used in Fintech, as mainly mentioned in several Fintech-related meetings of the Financial Stability Board, include Big Data, Blockchain, Artificial Intelligence, and Cloud Computing services, but it is also emphasized that it is not limited to the four types of technology mentioned above.

China's financial technology accompanied by the development of Internet finance, the shortcomings of traditional financial services and policy support and other factors to promote the rapid development of China's financial technology, scholars of China's financial technology development history of the division of different ways, but is broadly divided into three phases, namely, the first stage for the stage of traditional financial institutions, the use of science and technology is mainly in financial informatization, characterized by the use of network payments and credit cards; the second stage is the stage of traditional financial institutions, technology use is mainly in financial information, characterized by The use of network payment and credit cards; the second stage is the stage of Internet financial enterprises, financial services are characterized by P2P, crowdfunding and third-party payment; the third stage is the stage of non-financial institutions and individuals, this stage of finance and technology to a more in-depth integration of the main financial innovations featured in microfinance, digital currency and intelligent financial management (Du, 2020).

Fintech is used in a wide range of operational aspects of the financial industry, not only for the innovation of financial products and services, increasing customer service satisfaction and efficiency, but also in the protection of information and property and risk control. In terms of daily operation and management, Fintech improves the level of information acquisition and the efficiency of information processing through the integration of enterprise information, assisting banks in handling other businesses and thus improving productivity.

2.3 Literature on the relationship between the degree of Fintech transformation and development capability

Cai et al. (2023) found that innovative and strong technology has a significant contribution to the customer base, risk management capability, and operational performance of large banks, while it does not have a significant contribution to small and medium-sized banks. Digital transformation has a significant role in promoting the cost efficiency of commercial banks, and the technologies that have a significant role include artificial intelligence, cloud computing, and digital technology (Sun and Lu, 2022). Song et al. (2023) found that by reducing cost and profit efficiency, the development of Fintech will inhibit liquidity creation on the asset side and off-balance sheet of banks. In terms of operating performance, there is a negative and significant relationship between Fintech investment and non-performing loan risk, and the development of Fintech indirectly has a positive impact on banks' operating performance by reducing the non-performing loan ratio and the cost-to-income ratio, which is more pronounced in the case of larger banks (Zhao and Bu, 2022; Wang et al., 2023). Wang et al. (2023) found that the degree of Fintech development and the loan size of enterprises show a trend of growth in the same direction, and also promote foreign direct investment. In terms of the profitability of banks, scholars hold different opinions. Wu and Zhang (2023) found a negative correlation between the degree of Fintech development and the profitability level of state-owned commercial banks through their study. Li et al. (2022) concluded that the benefit effect brought by Fintech is greater than the cost effect, i.e., it significantly improves the profitability of banks. The use

of big data analytics capabilities can significantly improve the performance of the banking industry (Al-Dmour et al., 2021). Zhang (2022) argued that Fintech can significantly improve the profitability of commercial banks, especially listed and state-owned banks, artificial intelligence, and big data technology (Blockchain and cloud computing technology do not have a significant impact on profitability). However, Yue et al. (2022) argued that by increasing non-interest income and reducing total costs, there is a significant inverted U-shaped relationship between the level of Fintech and the profitability of commercial banks and that the initial stage of development can effectively improve the profitability level of banks, especially small urban commercial banks, but with the further advancement and development of the technology, the role of technology in promoting profitability tends to weaken. However, in the long run, it seems that Fintech will become the core driving force for the sustainable development of the financial industry in the future, bringing great benefits to financial institutions (He et al., 2021). The main types of Fintech technologies include cloud computing, Blockchain, big data, artificial intelligence, etc., which, when applied together, create a convergence effect and increase the operational efficiency of the commercial banking system. At present, cloud computing can effectively reduce the management cost and maintenance cost of commercial bank accounts and improve the efficiency of information integration; the use of Blockchain technology by major banks can not only improve the development of China's cross-border settlement but also effectively solve the problem of information asymmetry in the transaction and reduce credit costs and credit risks (Long et al., 2023). The following is a compilation of studies related to the four major Fintech technology categories and the development capability of enterprises, respectively.

Cloud computing is a comprehensive technology that combines Fintechs such as big data and Blockchain, which promotes the development of supply chain finance, improves the efficiency of financing, and reduces the operational and risk costs of banks (Zhao, 2021). The basic premise of whether a financial institution can realize digitalization is whether the cloud computing infrastructure is well built or not, and the application of cloud computing will accelerate the digital transformation of the entire financial industry, which in turn will reduce costs and increase efficiency (Hu, 2020). However, because cloud computing, big data, and artificial intelligence have impacted the asset and liability business of commercial banks, they will have a dampening effect on the profitability of commercial banks to a certain extent (Li et al., 2021).

Artificial Intelligence (AI) technology will be widely used in the financial industry rapidly and is likely to contribute huge profits to the banking industry, and banking institutions and technology companies will actively cooperate to effectively prevent internal and external risks (Liu, 2020). Artificial Intelligence effectively solves and improves some of the deficiencies and problems in the financial industry in the areas of marketing, credit customer service, wealth management, and risk control (Zhao and Zhou, 2021). Since 2023, the AI-generated grand model, typified by CHATGPT, has gradually gained full popularity, and the application of the grand model can promote the sustainable development of banks and the banking market by reducing the cost of commercial banks,

improving the operational system, and enhancing the efficiency of the staff's office, and therefore the overall operational efficiency of the banks has been effectively improved (Gong and Jiang, 2023).

The "AI+X" model represents that AI technology will empower various industries, so the successful use of Fintech empowerment can more effectively promote the development of the financial industry (Su, 2023).

The development of Fintech such as big data accelerates the intelligent transformation of banks, and their operations and management are characterized by digitalization and intelligence (Yang, 2023). Big data analytics technology affects banks' internal decision-making processes, stability, and financial performance (Zhu and Yang, 2021). It will change the bank's business model, improve organizational performance and capital operating efficiency and profitability; and with the improvement of technology level, the application of big data technology helps banks to make effective decisions in business, marketing, asset-liability management, etc., which directly improves the management level of commercial banks (Wei and Ling, 2013). Big data analysis can also help commercial banks to accurately select market segments and develop different products, which not only broadens financing channels for SMEs but also reduces the risk of default and non-performing loan rates for banks, creating a win-win situation for both customers and banks. However, the cost of developing and building a big data system is high, and the return will be lower in the short term, because incomplete information about MSME customers may lead to the bank abandoning this part of the business, thus entering a bad cycle (Hu, 2017). Big data reduces the cost of searching for information and the asymmetry of market information, which leads to an increase in the operational efficiency of commercial banks as well as government efficiency.

Blockchain is a decentralized technology that guarantees validity through digital signatures and uses crypto mathematics to generate associated blocks of data, whereas each block of data records all the information about a transaction at a specific time and generates a link to the next block (Fang and He, 2017). It plays a role in commercial banks' note business, cross-border payment business, and asset securitization by reducing the transaction costs of the cooperating parties, so the efficiency of operation and management is greatly improved (Wu and Duan,2019). Blockchain technology reduces the cost of reviewing information by simplifying the bank's account-opening process; completes the cross-regional query of customer information and solves the problem of information asymmetry; and features traceable information and real-time supervision of the use of accounts (Wang, 2024). In bank cross-border transactions, Blockchain can reduce the bank's credit risk, and the simplification of the payment process for the bank is the extra cost earnings will be reduced. But in the long run, the adoption of Blockchain technology by banks has become an international development trend (Zhang, 2019). Therefore, this paper proposes the following hypotheses:

H1: Fintech has a significant role in improving the ability of enterprise development.

2.4 Research on the relationship between corporate governance and the development capability of enterprises

Currently, scholars' studies show that corporate governance has a positive impact on the development capacity of enterprises. Wang et al. (2016) studied that the positive interaction of corporate governance and corporate social responsibility can improve the level of sustainable development of enterprises, which in turn generates a synergistic effect of "1 + 1 > 2". Ma and Qiao (2018) conducted a study on listed companies in Tibet, and they believe that listed companies in Tibet still need to optimize the equity structure and the compliance of the board of directors' setup and operation to enhance the company's sustainable development ability. Wei (2019) conducted a study on small and medium-sized innovative enterprises, and the study showed that Chinese innovative enterprises should introduce a dual equity structure system, which will be able to effectively help the sustainable development ability of small and medium-sized innovative enterprises. Zhao et al. (2020) found that a decentralized equity structure and diversified executive structure can significantly improve the sustainable development ability of enterprises.

Other scholars have found that the impact of corporate governance on corporate profitability has a lag, for example, Luo and Zhao (2022) showed that the performance of corporate governance not only significantly improves the financial performance of enterprises in the current period, but also has a different magnitude of the financial performance of the lagged one to two periods. Therefore, this paper proposes the following research hypotheses:

H2: Corporate governance performance has a positive and significant effect on the development capability of enterprises.

Among them:

H2-1: Current period corporate governance performance has a positive and significant effect on current period corporate development capability.

H2-2: Corporate governance performance in the previous period has a positive and significant effect on corporate development capability in the current period.

2.5 Research on the relationship between corporate governance and the degree of Fintech transformation

Guo et al. (2023) showed that, among the characteristics of the equity structure, higher equity concentration has a significant contribution to the development of Fintech in the financial industry because it is more dominant, reduces friction in communication therefore improves decision-making efficiency. Du et al. (2023) found that senior executives with IT background can help inhibit management myopia as well as expand the breadth of the company's innovation search and promote R&D investment, so it helps to promote Fintech innovation; however, differences in the position of the executives and the type of innovation technology of Fintech as well as the regional Fintech

industry policy also affect the effectiveness of executives with IT background in promoting Fintech innovation. There will also be differences.

However, some scholars believe that the effectiveness of the above corporate governance behavior has a lag effect, for example, Zhang and Xu (2014) showed that the equity concentration, equity checks and balances of small and medium-sized listed companies have a significant impact on the innovation investment in the current period and the lag period. Therefore, this paper proposes the following research hypothesis:

H3: Corporate governance performance has a significant effect on the degree of Fintech transformation.

Among them:

H3-1: Corporate governance performance in the current period has a significant enhancing effect on the degree of Fintech transformation in the current period.

H3-2: Corporate governance performance in the previous period has a significant enhancing effect on the degree of Fintech transformation in the current period.

2.6 Research on the association between the degree of Fintech transformation, corporate governance, and development capability

From the existing literature, few scholars have studied the relationship between the degree of Fintech transformation and corporate governance and development capability. Only Tang et al. (2009) study the relationship between equity incentives, innovation investment, and sustainable development, which shows that equity incentives are the driving force of technological innovation and sustainable development of enterprises. Based on the fact that financial technology is also a manifestation of technological innovation, this paper therefore establishes the following research hypotheses accordingly:

H4: Corporate governance performance has a moderating effect on the degree of Fintech transformation and enterprise development capability.

3. Methodology

Based on the hypothesis summarized in the literature review, the relationship between FinTech, corporate governance, and firm development capability is plotted as shown in Fig. 1 and used as the basis for the research design of this paper.

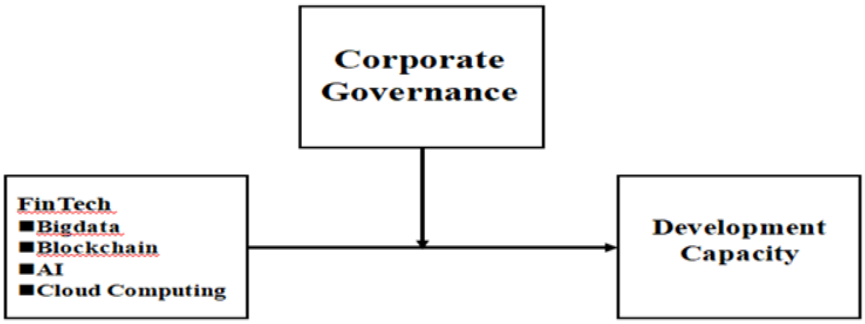

Figure 1. Relationship Between Degree of Fintech Transformation, Corporate Governance, and Development Capacity

3.1. Sample and period

As China has attached great importance to the development of FinTech in recent years, this paper selects listed companies in the Chinese financial industry from 2011-2022 to explore the relationship between the degree of FinTech transformation, corporate governance, and the development capability of enterprises, as well as the moderating role of the degree of FinTech transformation in the relationship between corporate governance and development capability.

3.2. Empirical Properties of the Data

In this paper, the OLS method is used to explore empirically, and the sample data are all obtained from the CSMAR database. After all the data are downloaded, firstly, the samples with missing data are eliminated, and then the extreme plants are eliminated, and a total of 682 samples are obtained. Referring to hypotheses H2-1, H2-2, H3-1, and H3-2 the degree of corporate governance and digital transformation has a lag, so this paper will also take a lag of one year for all the samples of the test, a total of 576 samples. The following are the regression models:

The impact of current FinTech and current corporate governance on current development capacity:

$$DEVR_{i,t} = \alpha_0 + \alpha_1 CG_{i,t} + \alpha_2 BGDT_{i,t} + \alpha_3 CG * BGDT_{i,t} + \alpha_4 SCALE_{i,t} + \alpha_5 DEBT_{i,t} + \alpha_6 AGE_{i,t} + \alpha_7 SOE_{i,t} + \alpha_8 CYEAR_{i,t} + \alpha_9 BANK_{i,t} + \varepsilon_0 \quad (1)$$

$$DEVR_{i,t} = \alpha_0 + \alpha_1 CG_{i,t} + \alpha_2 BLOCK_{i,t} + \alpha_3 CG * BLOCK_{i,t} + \alpha_4 SCALE_{i,t} + \alpha_5 DEBT_{i,t} + \alpha_6 AGE_{i,t} + \alpha_7 SOE_{i,t} + \alpha_8 CYEAR_{i,t} + \alpha_9 BANK_{i,t} + \varepsilon_0 \quad (2)$$

$$DEVR_{i,t} = \alpha_0 + \alpha_1 CG_{i,t} + \alpha_2 AI_{i,t} + \alpha_3 CG * AI_{i,t} + \alpha_4 SCALE_{i,t} + \alpha_5 DEBT_{i,t} + \alpha_6 AGE_{i,t} + \alpha_7 SOE_{i,t} + \alpha_8 CYEAR_{i,t} + \alpha_9 BANK_{i,t} + \varepsilon_0 \quad (3)$$

$$DEVR_{i,t} = \alpha_0 + \alpha_1 CG_{i,t} + \alpha_2 CLOUD_{i,t} + \alpha_3 CG * CLOUD_{i,t} + \alpha_4 SCALE_{i,t} + \alpha_5 DEBT_{i,t} + \alpha_6 AGE_{i,t} + \alpha_7 SOE_{i,t} + \alpha_8 CYEAR_{i,t} + \alpha_9 BANK_{i,t} + \varepsilon_0 \quad (4)$$

The impact of prior-period FinTech and prior-period corporate governance on the development capacity in the current period:

$$DEVR_{i,t} = \alpha_0 + \alpha_1 CG_{i,t-1} + \alpha_2 BGDT_{i,t-1} + \alpha_3 CG * BGDT_{i,t-1} + \alpha_4 SCALE_{i,t-1} + \alpha_5 DEBT_{i,t-1} + \alpha_6 AGE_{i,t-1} + \alpha_7 SOE_{i,t-1} + \alpha_8 CYEAR_{i,t-1} + \alpha_9 BANK_{i,t} + \varepsilon_0 \quad (1)$$

$$DEVR_{i,t} = \alpha_0 + \alpha_1 CG_{i,t-1} + \alpha_2 BLOCK_{i,t-1} + \alpha_3 CG * BLOCK_{i,t-1} + \alpha_4 SCALE_{i,t-1} + \alpha_5 DEBT_{i,t-1} + \alpha_6 AGE_{i,t-1} + \alpha_7 SOE_{i,t-1} + \alpha_8 CYEAR_{i,t-1} + \alpha_9 BANK_{i,t} + \varepsilon_0 \quad (2)$$

$$DEVR_{i,t} = \alpha_0 + \alpha_1 CG_{i,t-1} + \alpha_2 AI_{i,t-1} + \alpha_3 CG * AI_{i,t-1} + \alpha_4 SCALE_{i,t-1} + \alpha_5 DEBT_{i,t-1} + \alpha_6 AGE_{i,t-1} + \alpha_7 SOE_{i,t-1} + \alpha_8 CYEAR_{i,t-1} + \alpha_9 BANK_{i,t} + \varepsilon_0 \quad (3)$$

$$DEVR_{i,t} = \alpha_0 + \alpha_1 CG_{i,t-1} + \alpha_2 CLOUD_{i,t-1} + \alpha_3 CG * CLOUD_{i,t-1} + \alpha_4 SCALE_{i,t-1} + \alpha_5 DEBT_{i,t-1} + \alpha_6 AGE_{i,t-1} + \alpha_7 SOE_{i,t-1} + \alpha_8 CYEAR_{i,t-1} + \alpha_9 BANK_{i,t} + \varepsilon_0 \quad (4)$$

3.3 Description of variables

3.3.1 Dependent variable: the dependent variable selected in this paper is the development capability of the company, and the sustainable growth rate (DEVR) is used as a proxy variable for the development capability. The calculation formula is as follows:

Sustainable Growth Rate = (Net Profit/Average Balance of Total Owners' Equity)*[1 - Dividend Per Share Before Tax/(Current Value of Net Profit/Average Balance of Paid-up Capital)] = Return on Net Assets*(1 - Dividend Distribution Rate)

Where average balance = (opening balance + closing balance)/2

3.3.2 Independent variables: the independent variables in this paper are Financial Technology, with the four Financial Technology types selected from the Financial Technology evaluation system established by the CSMAR database, namely, big data (BGDT), Blockchain (BLOCK), artificial intelligence (AI) and cloud computing (CLOUD) as the proxy variables. The calculation method is based on the frequency of the four Fintech indicators mentioned above appearing in relevant statistical reports.

3.3.3 Moderating variable: the moderating variable of this paper is corporate governance performance (CG), considering the feasibility of sample acquisition, this paper selects Young and Wu's (2009) corporate governance evaluation model as a proxy variable for measuring corporate governance performance, which divides corporate governance into two aspects of evaluation: equity structure and board structure, however, concerning Guo et al. (2023) who found that the relationship between equity concentration and FinTech development has a positive enhancing effect, and a more concentrated equity structure helps shareholders to concentrate resources on innovative activities, thus facilitating the development of FinTech, therefore, this paper partially amends the index of equity structure based on the evaluation of corporate governance by Yang, and Wu (2009) to probe whether a more centralized equity structure can be conducive to the implementation of FinTech.

The detailed calculations are listed in the table below:

Table 1. Description of the Variables for Each Corporate Governance Indicator

Variable	Definition & Calculation	Source
Board structure		
Board size	It means the scale of the Board of Directors. Ranked from largest to smallest and percentile rank scores are calculated, with values closer to 1 indicating better governance mechanisms.	Beasley(1996) Yermack(1996) Abbott et al.(2004)
Dual	This is a dummy variable, 0 if the general manager or president is the same person as the chairman of the board, 1 otherwise.	Boyd(1994) Core et al.(1999)
Independent Directors	It means the percentage of independent directors on the company's board of directors. Ranked from largest to smallest and percentile rank scores are calculated, with values closer to 1 indicating better governance mechanisms.	Beasley(1996) Bedard et al.(2004)
Shareholding structure		
Shareholding of Directors and Supervisors	It means the ratio of shares held by directors and supervisors to the total number of shares issued by the company. They are Sorted from large to small, the percentile rank score of each company in the sample is calculated, and the values are converted to a scale of 0-1, with values closer to 1 indicating better governance mechanisms. Note: This indicator was originally modeled to be sorted from smallest to largest, and this paper was modified to be sorted from largest to smallest based on the findings of Guo et al. (2023).	Jensen and Meckling(1976) Guo et al. (2023)
Institutional investor shareholding ratio	It means the shareholding of corporate shareholders. They are sorted from largest to smallest and calculate the percentile rank score, the closer the value is to 1, the better the governance mechanism is. Note: This indicator was originally modeled to be sorted from smallest to largest, but this paper was modified to be sorted from largest to smallest based on the findings of Guo Na et al. (2023).	Shleifer and Vishny(1997) Chung et al.(2002) Guo et al. (2023)
Two rights separation	Calculated as the difference between share control and cash flow rights. They are ranked from largest to smallest and percentile rank scores are calculated, with values closer to 1 indicating better governance mechanisms.	Claessens et al.(2000) La Porta et al.(2002)

Note: The above board structure and shareholding structure of a total of six effectiveness index value, each index value according to the calculation method may be between 0 ~ 1 value, the closer the total score of 6 indicates that the governance mechanism is better.

3.3.4 Control variables: firm size (SCALE), debt ratio (DEBT), firm age (AGE), nature of ownership (SOE), the COVID-19 year (CYEAR), and sub-industry classification (BANK) are selected as control variables in this paper, respectively.

4. Results

Table 2. Descriptive Statistics

Variable	Current Sample (N=682)				One-period lagged sample (N=576)			
	Minimum	**Maximum**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**
DEVR	0.000	0.216	0.077	0.044	0.000	0.197	0.076	0.041
CG	1.376	4.616	3.090	0.726	1.458	4.616	3.079	0.720
BGDT	0.000	26.000	4.372	4.876	0.000	27.000	4.389	4.975
CG*BGDT	-7.927	17.166	0.509	3.350	-8.000	17.507	0.492	3.442
BLOCK	0.000	2.000	0.057	0.284	0.000	2.000	0.038	0.240
CG*BLOCK	-0.115	1.040	0.020	0.134	-0.079	0.401	0.006	0.058
AI	0.000	22.000	2.120	3.704	0.000	22.000	2.089	3.802
CG*AI	-6.783	14.109	0.432	2.447	-6.746	19.101	0.475	2.866
CLOUD	0.000	11.000	0.993	1.812	0.000	11.000	0.964	1.807
CG*CLOUD	-3.017	5.950	0.172	1.052	-2.941	6.044	0.168	1.039
SCALE	22.172	31.036	26.818	2.082	22.172	30.968	26.809	2.074
DEBT	0.187	0.948	0.815	0.147	0.161	0.948	0.812	0.151
AGE	6.071	36.192	22.013	6.505	5.962	36.022	21.466	6.425
SOE	0.000	1.000	0.567	0.496	0.000	1.000	0.578	0.494
CYEAR	0.000	1.000	0.122	0.327	0.000	1.000	0.134	0.341
BANK	0.000	1.000	0.270	0.444	0.000	1.000	0.281	0.450

Note: For variable codes, please refer to 3.3 Description of variables.

As can be seen from Table 2, the average performance of the overall sample firms in terms of the degree of FinTech transformation is on the low side, and given the importance of FinTech to the development of the financial industry, it is necessary to explore how to utilize the function of corporate governance to facilitate the development of FinTech. In addition, the sample size of this paper is small, however, there is considerable variation in business performance among the sample firms, and most of the variables are not normally distributed, so to retain as much sample size as possible, it is appropriate to adopt the Winsorize method to deal with the extremes in this paper.

In this paper, we first examine the appropriateness of each indicator in the OLS regression results to assess whether the regression design is reasonable. First, regarding the explanatory power of the model, the range of adjusted R-square in Tables 3 to 6 is 0.246 to 0.280, which is within a reasonable range in the research in the field of social sciences. Secondly, the F-values in Tables 3 to 6 are all significant, indicating that the regression model in this paper is predictable. Moreover, the D-W values in Tables 3 to 6 range from 1.073 to 1.169, which indicates that there is no significant omission of variables in the regression model. Finally, the VIF values in Tables 3 to 6 range from 1.026 to 4.546, indicating that there is no obvious homogeneity of the variables in the regression model in this paper. Next, the empirical results will be analyzed and explained.

Table 3. Empirical Results of Model (1) and Model (5)

Variable	Model 1(N=682)				Model 5(N=576)			
	Coefficient	**t**	**p**	**VIF**	**Coefficient**	**t**	**p**	**VIF**
Intercept	-0.025	-0.848	0.397		-0.002	-0.082	0.934	
CG	0.000	0.149	0.882	1.180	0.002	0.737	0.461	1.153
BGDT	-0.001	-3.242	0.001***	1.467	-0.001	-3.442	0.001***	1.464
CG*BGDT	0.001	1.444	0.149	1.128	0.001	1.819	0.069*	1.130
SCALE	0.002	1.644	0.101	3.948	0.001	0.698	0.485	4.070
DEBT	0.068	4.512	0.000***	2.471	0.072	4.823	0.000***	2.606
AGE	-0.001	-2.560	0.011**	1.119	-0.001	-2.316	0.021**	1.131
SOE	-0.008	-2.630	0.009***	1.126	-0.008	-2.544	0.011**	1.129
CYEAR	-0.009	-2.154	0.032**	1.029	0.001	0.306	0.760	1.046
BANK	0.035	7.583	0.000***	2.170	0.036	7.988	0.000***	2.191
Adj_R^2		0.318				0.348		
F Value		36.210***				35.134***		
D-W		1.077				1.160		

Note 1: For variable codes, please refer to 3.3 Description of variables.

Note 2: Significance is *** when P<=0.01, ** when 0.01<P<=0.05, and ** when 0.05<P<=0.1.

From the result of the model (1), the current period corporate governance performance and the interaction term of the degree of big data transformation and corporate governance both have no significant impact on enterprise development, and even the degree of big data transformation shows a negative significant impact on firm development. Then see the result from the model (5), although the last period of the corporate governance performance still has no significant impact on the firm's development, however, the interaction term of the corporate governance and the big data transformation degree shows a positive and significant impact on firm development, indicating that corporate governance performance has a lagged moderating effect between big data transformation degree and the firm's development ability.

Table 4. Empirical Results of Model (2) and Model (6)

Variable	Model 2(N=682)				Model 6(N=576)			
	Coefficient	**t**	**p**	**VIF**	**Coefficient**	**t**	**p**	**VIF**
Intercept	0.000	-0.008	0.994		0.027	0.956	0.339	
CG	0.000	0.155	0.877	1.259	0.002	0.730	0.466	1.522
BLOCK	-0.013	-1.927	0.054*	1.933	-0.008	-0.998	0.319	1.697
CG*BLOCK	0.002	0.156	0.876	1.908	0.016	0.481	0.630	1.957
SCALE	0.001	0.921	0.357	3.603	0.000	-0.238	0.812	3.745
DEBT	0.065	4.332	0.000***	2.463	0.070	4.660	0.000***	2.604
AGE	-0.001	-2.570	0.010***	1.117	-0.001	-2.513	0.012**	1.118
SOE	-0.007	-2.264	0.024**	1.097	-0.006	-1.992	0.047**	1.098
CYEAR	-0.010	-2.237	0.026**	1.026	0.001	0.140	0.889	1.047
BANK	0.038	8.170	0.000***	2.110	0.039	8.548	0.000***	2.135
Adj_R^2	0.313				0.335			
F Value	35.445***				33.199***			
D-W	1.073				1.142			

Note 1: For variable codes, please refer to 3.3 Description of variables

Note 2: Significance is *** when P<=0.01, ** when 0.01<P<=0.05, and ** when 0.05<P<=0.1.

From the empirical results of model (2), the current period of corporate governance performance, and the interaction term of the degree of Blockchain transformation and corporate governance both have no significant impact on enterprise development, and even the degree of Blockchain transformation shows a negative significant impact on firm development. Then see the empirical results of model (6), no matter the degree of Blockchain transformation degree, corporate governance performance, and the interaction term of the two, all have no significant impact on the lagged period's development capacity. That indicates that the negative impact of the Blockchain transformation degree for the current period on a firm's development capacity has been eliminated in the lagged period.

Table 5. Empirical Results of Model (3) and Model (7)

Variable	Model 3(N=682)				Model 7(N=576)			
	Coefficient	**t**	**p**	**VIF**	**Coefficient**	**t**	**p**	**VIF**
Intercept	-0.041	-1.333	0.183		-0.017	-0.559	0.576	
CG	0.001	0.290	0.772	1.184	0.002	0.835	0.404	1.156
AI	-0.002	-3.401	0.001***	1.923	-0.002	-3.461	0.001***	2.098
CG*AI	0.001	1.589	0.112	1.354	0.001	2.069	0.039**	1.483
SCALE	0.003	2.072	0.039**	4.409	0.002	1.141	0.254	4.546
DEBT	0.059	3.914	0.000***	2.520	0.063	4.189	0.000***	2.664
AGE	0.000	-2.071	0.039**	1.166	0.000	-1.872	0.062*	1.184
SOE	-0.008	-2.773	0.006***	1.145	-0.008	-2.719	0.007***	1.160
CYEAR	-0.009	-2.121	0.034**	1.029	0.002	0.418	0.676	1.051
BANK	0.034	7.252	0.000***	2.216	0.036	7.742	0.000***	2.235
Adj_R^2		0.318				0.348		
F Value		36.339***				35.062***		
D-W		1.083				1.169		

Note 1: For variable codes, please refer to 3.3 Description of variables

Note 2: Significance is *** when P<=0.01, ** when 0.01<P<=0.05, and ** when 0.05<P<=0.1.

The empirical results of model (3) show that the degree of AI transformation in the current period has a negative and significant impact on corporate development capabilities. However, the intersection terms of corporate governance and the degree of corporate governance and artificial intelligence transformation have no significant impact on corporate development capabilities. Again Comparing the empirical results of model (7), it can be seen that although corporate governance performance alone has no significant impact on the performance of one lagged period, the cross-term of corporate governance and the degree of artificial intelligence transformation has a significant impact on the performance of enterprises lagged one period. Development capabilities show a positive and significant impact, which means that corporate governance has a lagged moderating effect between the degree of artificial intelligence transformation and corporate development capabilities.

Table 6. Empirical Results of Model (4) and Model (8)

Variable	Model 4(N=682)				Model 8(N=576)			
	Coefficient	**t**	**p**	**VIF**	**Coefficient**	**t**	**p**	**VIF**
Intercept	-0.029	-1.023	0.307		-0.002	-0.075	0.941	
CG	0.001	0.487	0.626	1.192	0.002	1.026	0.306	1.173
CLOUD	-0.004	-3.950	0.000***	1.531	-0.004	-3.705	0.000***	1.537
CG*CLOUD	0.004	2.453	0.014**	1.216	0.003	1.984	0.048**	1.232
SCALE	0.002	1.746	0.081*	3.886	0.001	0.633	0.527	3.987
DEBT	0.064	4.297	0.000***	2.477	0.069	4.620	0.000***	2.608
AGE	-0.001	-2.242	0.025**	1.141	0.000	-2.001	0.046**	1.154
SOE	-0.009	-2.922	0.004***	1.150	-0.008	-2.766	0.006***	1.156
CYEAR	-0.009	-1.986	0.047**	1.035	0.002	0.541	0.589	1.057
BANK	0.035	7.560	0.000***	2.153	0.036	8.007	0.000***	2.185
Adj_R^2		0.323				0.360		
F Value		37.142***				35.391***		
D-W		1.080				1.159		

Note 1: For variable codes, please refer to 3.3 Description of variables

Note 2: Significance is *** when P<=0.01, ** when 0.01<P<=0.05, and ** when 0.05<P<=0.1.

It can be seen from the empirical results of model (4) that the degree of cloud computing transformation in the current period, corporate governance performance, and the intersection terms of the above two have no significant impact on the current enterprise development capabilities respectively, with a negative significant impact and a positive significant impact. It shows that corporate governance performance has a positive regulating effect between the degree of cloud computing transformation and enterprise development capabilities in the current period. From the empirical results of model (8), we know that corporate governance has a lagging effect on enterprise development capabilities. The negative significant impact of the degree of cloud computing transformation on the development capabilities of enterprises in the first lag period is also slightly weakened, while the moderating role of corporate governance between the degree of cloud computing transformation and corporate governance still plays a role in the first lag period, but the degree of significance slightly lowered.

5. Conclusions and recommendations

5.1 Conclusions

The paper selects the listed companies in the Chinese financial industry from 2011-2022 as the samples and uses the OLS method to explore the correlation between Fintech construction inputs in the three aspects of financial industry corporate governance and enterprise sustainable development capability, and the moderating role of corporate governance performance between Fintech and development capability, and conducts the test of lagging. The findings are summarized below:

(1) The degree of transformation of big data, Blockchain, artificial intelligence, and cloud computing will have a negative and significant impact on the development capabilities of enterprises during the current period.

(2) Corporate governance performance with high ownership concentration will show a positively significant moderating effect between the degree of cloud computing transformation and the firm's development capability in the current period and lagged one period.

(3) Corporate governance performance with high ownership concentration will show a positively significant moderating effect between the degree of big data and AI transformation and the firm's development capability in the lagged one period.

(4) For Blockchain, although both the corporate governance performance with high ownership concentration and the interaction term of the Blockchain transformation and corporate governance do not have significant impact on the firm's development capability in current and lagged one period, however, the negative significant impact of Blockchain transformation on the firm's development capability has been eliminate in lagged period.

5.2 Recommendations

Based on the above research findings, this paper puts forward the corresponding recommendations as follows:

5.2.1 Corporate governance

The financial technology input and implementation process requires resources in addition to huge funds, but also needs professional talents and an experienced project team. At this point, corporate governance will play a key role; a highly concentrated shareholding structure is usually held by institutional investors or major shareholders as directors and supervisors, and in the process of Fintech investment, the capital, rich operating resources, and strong dominance of institutional investors with concentrated shareholdings will help Fintech innovation input and output. Although, according to the general theory of corporate governance, the more decentralized the shareholding, the more it can prevent the manipulation of major shareholders and deprivation of the rights of minority shareholders, however, the industry characteristics of the financial industry are different from those of traditional industries in general, and there are also various national regulatory agencies, such as the People's Bank of China, the State Administration of Financial Supervision and Administration of the People's Republic of China, the Securities and Futures Commission, etc., which are responsible for the strict monitoring of the operation process, so that the manipulation of operation by major shareholders and deprivation of minority shareholders will be relatively reduced. In this case, the disadvantages of equity concentration are less likely to occur, and instead, the advantages of higher equity concentration can be utilized to help the company carry out innovative activities. Therefore, it is suggested that listed companies in the financial industry can increase their equity concentration as appropriate within the limit of shareholders' shareholding ratio stipulated in the securities law to help provide resources for the transformation of financial technology.

5.2.2 Fintech investment

Fintech investment is not just a closed door, the financial industry should focus on Fintech transformation work, and for this reason to extend the professional team, empirical results show that if there is no good corporate governance, that is, good directors, supervisors and executives, Fintech investment is likely to drag down the company's operations. Therefore, the financial industry should be prepared for the transformation of corporate governance and financial technology early to efficiently and complete the transformation of financial technology to cope with the future trend of financial technology, and the initial investment in performance may not be good, but as long as there is a professional team and senior leaders to grasp the business policy after some time on the benefits brought by the financial technology will be apparent.

5.3 Research limitation

Based on the limitation of sample acquisition, this paper can only evaluate the corporate governance performance of the sample companies with six indicators in terms of both equity structure

and board structure. Although the model is recognized by academics, the small number of indicators reduces the possibility of more in-depth exploration.

5.4 Future Research Directions

There are two directions for future research: first, the development of a more detailed corporate governance evaluation model will help to explore corporate governance more deeply. The second is that the current indicator for measuring the degree of Fintech transformation is only the number of word frequencies, and if an evaluation model can be developed in the future to measure the results of Fintech implementation, it will help scholars interested in researching this field to conduct more in-depth research.

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