

Review

An Overview of the Impact of Digital Transformation on the Risk-taking of Commercial Banks

An-qi Huang ^{1,*} and Da-wei Tan ²¹ School of Management Science and Engineering, Southwestern University of Finance and Economics, Chengdu (611130), Sichuan, China² School of International Business, Southwestern University of Finance and Economics, Chengdu (611130), Sichuan, China

* Correspondence: 630333133@qq.com

Received: March 29, 2024; Received in revised form: June 18, 2024; Accepted: June 28, 2024; Available online: June 30, 2024

Abstract: The digital transformation of commercial banks has been a general trend, and the new services brought by this new technology are becoming increasingly popular among customers and banks. For enabling customers to enjoy better service and banks to operate more efficiently and stably, the impact of digital transformation on the risk-taking of commercial banks has therefore attracted attention. By combing domestic and foreign research literature from 2016 to 2023, this paper respectively explores the significance, type and development status of the digital transformation of commercial banks, commercial banks' risk-taking and corresponding influencing factors, as well as impacts of digital transformation on the risk-taking. Conclusively, although there is no precise and unified conclusion on the impact of digital transformation on commercial banks' risk-taking, it does have the effect of reducing risk-taking under certain conditions. Hence, commercial banks need to analyze specific problems and use good strategies to overcome difficulties, and finally reach the outcome of reducing risk-taking through digital transformation.

Keywords: Commercial Bank; Digital Transformation; Risk-taking; Literature Review

1. Introduction

In March 2021, the State Council issued the "14th Five Year Plan for the Development of Digital Economy" (Guofa [2021] No. 29), which proposes that the digital economy is the main economic form after the agricultural economy and industrial economy. It is a new economic form with data resources as the key element, modern information networks as the main carrier, as well as the integration and application of information, communication technology and the digital transformation of all factors as important driving forces, promoting a more unified fairness and efficiency. During the 14th Five Year Plan period, it is necessary to promote digital transformation through two paths: digital industrialization and industrial digitization. Digital technologies represented by blockchain, big data, the Internet of Things, artificial intelligence, 5G, etc. are rapidly changing various industries and deeply integrating with the real economy. According to relevant data, the scale of China's digital economy was only 11 trillion yuan in 2012, accounting for 21.6% of domestic GDP. In 2021, the total scale of China's digital economy reached 45 trillion-yuan, accounting for nearly 40% of GDP, achieving a huge leap in quantity.

The digital transformation of commercial banks is an inevitable choice to adapt to the development of the digital economy today. In January 2022, the China Banking and Insurance Regulatory Commission issued the "Guiding Opinions on the Digital Transformation of the Banking and Insurance Industry" (Banking and Insurance Regulatory Office [2022] No. 2), which clarified the work goals of the entire industry's digital transformation. It is essential to achieve orderly practice of financial innovation based on data assets and digital technology by 2025, and the digital transformation of the banking and insurance industry nationwide will achieve significant results.

From this, digital technology has gradually become a new driving force for China's economic development from low-quality to high-quality (Xu et al., 2022) [1]. At the same time, the digital transformation of commercial banks is also a necessary way for them to pursue further development. This article mainly reviews research literature from 2016 to 2023 at home and abroad, focusing on commercial banks to explore the significance and development status of their digital transformation, as well as the impact of digital transformation on their risk-taking.

2. Digital Transformation of Commercial Banks

To further innovate and develop the banking industry with high quality, the requirements for digital transformation of commercial banks have been clearly put forward.

2.1. The Significance of Digital Transformation in Commercial Banks

2.1.1. The Conceptual Significance of Digital Transformation in Commercial Banks

Commercial banks' digital transformation technically means the process of integrating digital technology and finance, continuously developing digital finance such as technology finance, inclusive finance, cloud finance, and intelligent finance (Shi, 2022) [2]; From the perspective of business model transformation, it is the process of utilizing fintech from departmental banks to process banks and forming omnichannel integration (Li, 2019) [3]; Essentially, it refers to the automated data flow of commercial banks (Luo, 2022) [4]. This process has four characteristics: "customer-centric service and experience", "driven by internal and external data", "relying on technology to improve efficiency", and "innovating and optimizing organizational connotation" (Chen et al., 2022) [5]. For example, Pingan Bank's core technology "AI bank" and dual strategic main carrier "Financial One Account" have brought high stickiness customers to Pingan Bank (Shi, 2021) [6]. Another sample is the big data cloud platform independently developed by China Construction Bank which has achieved the largest storage computing separation database processing cluster in the industry (Shi, 2022) [2].

2.1.2. The Strategic Significance of Digital Transformation in Commercial Banks

Chen et al. (2022) [5] analyze the intrinsic value of commercial banks in promoting digital transformation, which includes actively acquiring individuals, legal entities, governments, rural users, improving customer stickiness and retention rates. Abdulkhamitovna (2023) [7] takes the digitalization of commercial banks in Uzbekistan as an example and concludes that the strategic significance of digital transformation is to enhance the competitiveness and profitability of commercial banks while providing resources for customers and banks. In addition, the use of financial technology by commercial banks to digitize is also a way to avoid or reduce risks, which

can ensure the security and stability of commercial banks' services in the face of threats similar to the COVID-19, that is, the use of automated data flow to positively respond to environmental uncertainty (Qin, 2021; Luo, 2022) [8, 4].

2.2. *The Development Status of Digital Transformation in Commercial Banks*

2.2.1. The Development Trends of Digital Transformation in Commercial Banks

Wang (2021) [9] summarizes that major banks across the country have increased the use of financial technology and enhanced their strategic position, focusing on serving the real economy and beginning different forms of digital transformation. Commercial banks have experienced trends such as disintermediation, in-depth research on financial technology, online transactions, and flattened internal organizations (Yan, 2021) [10]. During the period 2020-2022, the COVID-19 will promote commercial banks and even all sectors of society to accelerate the pace of digital transformation (Sajid et al., 2023) [11]. Ouyang et al. (2022) [12] point out that by connecting with the data asset ecosystem of commercial banks, traditional models of small and micro finance in commercial banks can be transformed and developed towards digitalization, to achieve the integration of small and micro finance supply and data asset market.

This trend is in line with the policy and even strategic requirements of economic development in various countries (Abdulhamitovna, 2023; Latifovna, 2022; Wang, 2021) [7, 13, 9]. Latifovna (2022) [13] points out that digital transformation can promote the service efficiency of commercial banks and even the overall level of the economy. Meanwhile, Abdulhamitovna (2023) [7] believes that the significant increase in demand and user recognition after the digital transformation of commercial banks indicate the inevitability of the trend of banking service transformation.

2.2.2. Types of Digital Transformation in Commercial Banks

There are three main types of digital transformation of commercial banks: Internet finance, financial technology and digital finance. Internet finance refers to the combination of financial business and mobile Internet (Ding, 2021) [14]. Digital finance is a digital financial business of financial institutions cooperating with Internet enterprises. It is a combination of information, data and traditional financial services, considering technology and finance. Financial technology emphasizes the technological aspect, emphasizing the cost reduction and efficiency improvement of technologies such as cloud computing and big data, to better serve customers (Yu et al., 2021; Huang, 2018; Gomber et al., 2017) [15, 16, 17]. Financial technology can enhance the efficiency and risk assessment capabilities of digital finance, but it can also trigger systemic digital financial risks (Zhu, 2021) [18].

2.2.3. The Development Dilemma of Digital Transformation in Commercial Banks

The internal organizational structure's ineffectiveness and coordination mechanism's inadequacy of a commercial bank can lead to information data silos, resulting in an increase in information barriers; Versatile talents who are proficient in both finance and technology are lack; It is difficult to ensure the security because customer information becomes increasingly abundant and financial connections among enterprises are strengthened, rendering faster risk propagation and security risks during information conversion when, meanwhile, types of risks are more complex and

commercial banks have higher requirements for risk response capabilities; The strategic positioning of the four commercial banks is unclear, with insufficient technological innovation and severe product homogenization (Shi, 2022; Qian, 2022) [2, 19].

2.2.4. Development Strategies for Digital Transformation of Commercial Banks

To better promote the digital transformation of commercial banks, firstly, customer-centric services should be provided, which could utilize financial technology to actively interact and ensure user stickiness (Shi, 2021; Lin, 2022) [6, 20]; Secondly, vigorous cultivation of versatile talents should be conducted to ensure the integration of scientific and technological accuracy with disciplinary thinking; Thirdly, active cooperations with fintech companies should be implemented to ensure technological innovation and provide security checks, offer better services to customers, and also provide more effective technology for commercial banks; Fourthly, organizational structure and culture should be adjusted to adapt to the impact of financial technology; Fifthly, banks should face the world with new technologies, strong technology, and more comfortable services, which also should be integrated into the international financial system to better adapt to the digital business environment.

3. Risk Assumption of Commercial Banks

3.1. Definition of Risk-taking in Commercial Banks

Commercial bank risk-taking refers to the balance of risks and benefits through different business decisions to maximize interests of commercial banks which should actively undertake the risks brought by such business decisions (Yu et al., 2018) [21]. It also means the magnitude of all risks that commercial banks need to bear and will affect operations, resource utilization, and profitability (Boyd and Nicolo, 2005) [22].

3.2. Factors Influencing Commercial Bank Risk-taking

The core factor is the asset liability characteristics of commercial banks, including liquidity and operational capabilities (Dell' Riccia and Marquez, 2010) [23]. Micro level influencing factors such as the degree of shareholder centralization can increase risk-taking (Kong et al., 2008) [24]. The policy environment in macro level also affects the risk-taking of commercial banks, such as a loose monetary policy, low interest rate environment or economic policy uncertainty (Wei et al., 2022; Li et al., 2020; Gu et al., 2019) [25, 26, 27].

4. The Impact of Digital Transformation on the Risk Undertaking of Commercial Banks

The risk-taking ability of commercial banks has a profound impact on the quality and sustainability of the services they provide thereby a certain impact on their customer stickiness and profitability will be caused.

4.1. Research on the Overall Impact of Digital Transformation on the Risk-taking of Commercial Banks

Jiang et al. (2023) [28] use text mining methods to empirically analyze that digital transformation reduces its risk-taking level through a significant negative correlation with bank management costs and a significant positive correlation with operational efficiency; Jiang et al. (2023) [28] find that the

impact of digital transformation on bank risk-taking exhibits structural heterogeneity: in terms of bank scale, digital transformation has a more significant inhibitory effect on the risk-taking level of small-scale banks, while in the aspect of financial technology types, blockchain technology and other transformations have a certain degree of impact on bank risk-taking from large to small. An increase in industry concentration will weaken the inhibitory effect of digital transformation on bank risk-taking; Zhai et al. (2023) [29] construct a multiple regression model and conduct a mediation effect test, which finally illustrates that digital transformation of commercial banks can reduce their risk-taking by decreasing information asymmetry and improving efficiency. This impact is relatively small for small and state-owned commercial banks or those located in non-eastern regions.

In summary, digital transformation can to some extent reduce the risk-taking level of commercial banks.

4.2. Internet Finance and Risk Bearing of Commercial Banks

Some research results show that Internet finance can improve the level of risk-taking of commercial banks, and there is a certain heterogeneity. Guo et al. (2019) [30] find through the transmission mechanism that the development of Internet finance significantly increases the risk bearing of banks through two channels, namely, worsening the deposit structure and raising the cost of interest payment; Lv (2020) [31] states that Internet finance would enhance the risk-taking of commercial banks by establishing and using text mining method, factor analysis method and gray correlation method, but the significance of different bank types is different. Meng (2021) [32] explains that both Internet finance and market competition will increase risk-taking by building a dynamic panel data model, but the size of market competition and the type of commercial banks will be affected by Internet finance to a different extent.

However, several other results demonstrate that Internet finance can reduce the level of risk-taking of commercial banks and has a certain heterogeneity. Zhai (2019) [33] builds a dynamic panel model and concludes that Internet finance can reduce the risk-taking of commercial banks. In terms of heterogeneity, joint-stock commercial banks are affected more than urban commercial banks.

Moreover, there are other research results illustrating that the impact of Internet finance on the level of risk-taking of commercial banks is different under certain conditions. Liu (2016) [34] concludes that Internet finance has different effects on different types of banks through heterogeneity analysis: joint-stock banks have reduced risk-taking, other types of banks have improved to varying degrees, and urban commercial banks have the largest increase in bankruptcy risk. Li et al. (2020) [35] carry out differential generalized moment estimation and find that Internet finance has improved the risk-taking of commercial banks in general, but different banks classified according to their systemic importance have heterogeneity: the risk-taking of non-systemically important banks has increased, while Internet finance of other types of banks has reduced the risk-taking of commercial banks. Xu (2022) [36] establishes a systematic GMM regression model and describes that the impact of Internet finance on risk-taking of commercial banks is in a "U" shape. The impact of different assets of commercial banks and different functions of Internet finance on risk-taking is also different, in which the two functions of payment settlement and resource allocation will only reduce the risk-taking of commercial banks. Guo et al. (2022) [37] interprets that the development of Internet finance has a non-linear influence on risk-taking of commercial banks shown as the risk decrease in terms of credit and exchange rate and risk increase in aspects of liquidity and interest rate with various impact degrees,

which is derived from nonlinear model established by innovative methods such as information random walk, Jordan decomposition and factor augmentation.

To sum up, the impact of Internet finance on commercial banks' risk-taking is inconclusive, and even there are different impact modes due to different regions, development levels of Internet finance, functions of Internet finance and types of banks.

4.3. *Financial Technology and Risk-taking in Commercial Banks*

Digital transformation is an important part of the deep integration and development of technology and finance. Existing literature mainly focuses on the impact of "financial technology" on the risk-taking of commercial banks, represented by "digital transformation of banks", and mainly explores the specific transmission channels and actual impact effects of digital transformation on the risk-taking of commercial banks. Existing research generally adopts the Financial Stability Board's definition of fintech as technology driven innovation in financial services.

Most studies have found that financial technology has a reducing effect on the risk-taking of commercial banks, and there is a certain degree of heterogeneity. Berg et al. (2020) [38] believe that the use of financial technology can also supplement traditional credit reporting systems, improve loan quality from multiple dimensions, and reduce the risk-taking of commercial banks. Sajid et al. (2023) [11] construct a multiple regression model and conduct a mediation effect analysis, finding that fintech can reduce the risk-taking of commercial banks.

Jin et al. (2020) [39] use Python web crawler technology to construct a financial technology utilization index for commercial banks and find that financial technology significantly reduces the risk bearing level of commercial banks. At the same time, the use of financial technology narrows the gap in the ability of large banks and small and medium-sized banks to obtain soft information. In the field of small and micro enterprise loans, utilizing the cost advantage of funds has a crowding out effect on small banks. Wu (2021) [40] uses text mining to construct financial technology indicators at the bank level and found that the improvement of the bank's financial technology level significantly reduced its risk-taking. Wang et al. (2022) [41] construct a p-var model to explore the impact of digital consumer credit on the risk-taking of commercial banks in China, which remarks that digital consumer credit has risk transfer effects, business crowding out effects, and risk sharing effects on the risk-taking of commercial banks, further confirming that digital transformation can reduce the risk-taking level of commercial banks. He et al. (2022) [42] study the impact of financial technology development on the risk-taking of commercial banks using relevant data from 2011 to 2020 as a sample, and also concluded that financial technology development reduces the risk-taking of commercial banks. Su et al. (2022) [43] conduct empirical tests at the company level using manual collection and Python web crawler technology to obtain data on small and micro loans, corporate governance, and the level of intelligent risk control application of 117 small and medium-sized banks, which signifies that financial technology can promote risk control of urban commercial banks.

In terms of heterogeneity, He et al. (2022) [42] find through heterogeneity analysis that the factors causing heterogeneity include the size, type, and equity structure of commercial banks. Among them, size plays a role in regulating the impact of financial technology on risk-taking, and theoretically explains that the larger the bank size is, the more significant the risk mitigation effect of financial technology will be. Wu (2021) [40] finds heterogeneity in the types and regional characteristics of commercial banks, as follows: fintech has a significant effect on decreasing risk bearing in state-

owned banks, joint-stock banks, and banks in the eastern region, whereas its effect on reducing risk bearing in urban commercial banks, rural commercial banks, and banks in the central and western regions is weak.

However, some studies have found that fintech increases the risks faced by commercial banks and there is a certain degree of heterogeneity. Wang et al. (2020) [44] point out that the development of financial technology has intensified the risks of banks. Qian (2021) [45] uses web crawlers and text analysis to construct financial technology indicators for empirical analysis and draws a conclusion that financial technology generally increases the risk-taking of commercial banks, with small and medium-sized commercial banks or those located in highly market-oriented areas being more significantly affected.

Another part of the research has found that different periods of financial technology have various levels of risk-taking in commercial banks or the effects of financial technology on risk-taking in different sorts of commercial banks. Liu et al. (2021) [46] construct a multiple regression model and conduct an empirical analysis of the relationship between financial technology and risk-taking in the banking industry with a subsequent conclusion stating that the development of financial technology has an inverted U-shaped effect on the risk-taking of commercial banks, that is, increasing risk-taking in the early stage and decreasing it in the later stage.

In summary, in the field of research, the impact of financial technology on the risk-taking of commercial banks is currently uncertain. However, most studies have shown that financial technology can reduce the risk-taking level of commercial banks, and this impact has certain regional and bank type heterogeneity.

4.4. Digital Finance and Commercial Bank Risk-taking

Some research findings suggest that digital finance will increase the risk-taking of commercial banks and there is a certain degree of heterogeneity. Wu et al. (2021) [47] construct a multiple regression model and find that digital finance will make competition among small and medium-sized commercial banks more intense, thereby increasing their risk bearing. Wang et al. (2022) [48] conduct a multiple regression empirical analysis to explore the relationship between the explanatory variable representing the development of digital finance, the Digital HP Financial Index, and the dependent variable representing bank risk, such as the non-performing loan ratio, which explains that the development of digital finance will increase the risk bearing level of commercial banks. Liu et al. (2022) [49] propose that overall, digital finance improves the risk-taking level of commercial banks by increasing management costs. Heterogeneity is reflected in the more significant impact of digital finance on eastern regions and large and medium-sized commercial banks.

Some research findings suggest that digital finance will reduce the risk-taking of commercial banks and there is a certain degree of heterogeneity. Yu et al. (2021) [15] use the Peking University Inclusive Finance Index to measure digital finance and establish a benchmark regression model for empirical analysis, which gains a result that digital finance can converge risk, that is, reduce the risk bearing level of commercial banks. In terms of heterogeneity, urban commercial banks are more sensitive to digital finance than rural financial institutions compared to state-owned and large joint-stock banks. Sun et al. (2021) [50] conduct empirical research and analysis using a GMM estimation dynamic panel model with non-performing loan ratio as the dependent variable and digital economic development index as the independent variable, as well as a mediation effect model with financial

efficiency and innovation efficiency as the mediating variables. The study can substantiate that digital finance can reduce non-performing loan ratio, that is, reduce commercial bank risk-taking. Liu et al. (2022) [51], who also start with the non-performing loan ratio, conduct an empirical study on a two-way fixed effect with the non-performing loan ratio representing risk bearing as the dependent variable and the HP Financial Index as the independent variable. The conclusion reveals that digital finance can reduce the risk bearing of commercial banks, while heterogeneity is reflected in the fact that digital finance can significantly reduce the non-performing loan ratios of urban and rural commercial banks, while the effect of other types of banks is not significant. Banna et al. (2021) [52] construct a multiple regression model using the inclusivity index of digital finance as the independent variable and bank risk as the dependent variable for empirical research, which expounds that digital finance and its inclusivity can reduce the risk-taking of commercial banks, and compared to Islamic banks, other banks are more stable.

However, the relationship between digital finance and commercial bank risk-taking can also change under specific conditions, and there is a certain degree of heterogeneity. Liu et al. (2022) [53] conduct empirical analysis by establishing a multiple regression model between the structure of digital finance interactive loans and the risk-taking of commercial banks showing that digital finance does indeed enhance the risk-taking level of commercial banks, but improving short-term loans and reducing corporate competition can effectively reduce the risk-taking of commercial banks. Wei et al. (2022) [25] establish a multiple regression model for empirical analysis, indicating that the overall relationship between digital finance and the risk-taking level of commercial banks shows a U-shaped trend of first decreasing and then increasing. That is, the development level of digital finance is different, and the impact mode is also different. In terms of heterogeneity, it is reflected that large banks are not as sensitive as small and medium-sized commercial banks.

In summary, due to the different empirical methods and observation indicators chosen, there is currently no consensus on the impact of digital finance on the risk-taking of commercial banks, and there is also a certain degree of heterogeneity.

5. Brief Comment

This article reviews the research literature of domestic and foreign scholars from 2016 to 2023, studying the digital transformation of commercial banks, their risk-taking, and the impact of digital transformation on their risk-taking.

In terms of research methods, most of the goals and strategies for digital transformation are achieved through literature review and case analysis. However, in the study of the influencing factors of risk-taking in commercial banks and the impact of digital transformation on their risk-taking, empirical research with different methods is mostly used. In empirical research, most studies use the establishment of multiple regression equation models, supplemented by intermediate variable tests and heterogeneity tests, while a small portion use other mathematical theories for modeling and analysis.

In terms of research conclusions, digital transformation still faces challenges such as a shortage of composite talents, organizational structure unable to adapt to digital transformation, insufficient technological innovation and regulation. This requires financial institutions, especially commercial banks, to always adhere to the principle of customer first, adjust the internal structure and organizational culture of the organization, actively cooperate with technology companies, and

cultivate or recruit composite talents in finance and technology. There are two factors that affect the risk-taking of commercial banks: macro and micro. This requires commercial banks to pay attention to these factors and make active adjustments to their services.

There is currently no unified consensus on the impact of digital transformation on the risk-taking of commercial banks. Overall, digital transformation can indeed reduce the risk-taking of commercial banks to a certain extent but considering different digital transformation methods and the target audience under different methods, their impact effects are not the same.

Some studies suggest that the three main specific forms of digital transformation can reduce risk-taking, as they can promote the efficiency of commercial banks and reduce operating costs; However, some studies have found that the three main specific forms of digital transformation can increase the risk-taking of commercial banks, as intense market competition or high management costs in terms of demand for technology talents can expose banks to greater risks. Some studies suggest that the three main specific models of digital transformation have a U-shaped or non-linear impact on the risk-taking of commercial banks. Different types of services or technologies, or different times of digital transformation, will have different effects on risk-taking.

At the same time, there is also a certain degree of heterogeneity, and differences in regions and types of banks can lead to varying degrees and even directions of impact. For instance, eastern banks and state-owned banks are more adept at the impact of digital transformation, while small and medium-sized banks and urban commercial banks are more sensitive.

In summary, overall, digital transformation can bring customers a better service experience, but it also inevitably comes with certain risks. Commercial banks should tailor measures to local conditions, prescribe targeted solutions, analyze specific problems, make good use of the results of digital transformation, reduce their risk bearing level, improve the efficiency and profits of banks, and make everything develop for the better.

Acknowledgments: This research obtained some technical support from Dr. Yang Yang in the field of writing—review and editing.

Funding: This research was funded by the 2022 Undergraduate SWUFE Academic Elite Plan Project, grant number XSJY202205.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

- [1] Xu, Y., & Lu, M. (2022). Research on the Practice and Innovation Path of Digital Transformation Models in Commercial Banks--Based on the Analysis of Annual Reports of Some A-share Listed Banks in Recent Years. *Southwest Finance*, (8), 72-83.
- [2] Shi, M. (2022). Opportunities, Challenges, and Pathways for Digital Transformation of Commercial Banks. *Northern Finance*, (9), 81-84. <https://doi.org/10.16459/j.cnki.15-1370/f.2022.09.020>
- [3] Li, G. (2019). Direction and Practice of Digital Transformation in Commercial Banks. *Banker*, (3), 59-60. <https://doi.org/10.3969/j.issn.1671-1238.2019.03.017>
- [4] Luo, Y. (2022). Digital Transformation of Commercial Banks. *China Finance*, (1), 55-56.
- [5] Chen, L., & Liu, Y. (2022). Practice and Reflection on the Comprehensive Promotion of Digital Transformation by Commercial Banks. *Agricultural Bank Journal*, (4), 65-69. <https://doi.org/10.16678/j.cnki.42-1864/f.2022.04.015>

- [6] Shi, Y. (2021). Case Analysis of Digital Transformation of Commercial Banks under the Background of Financial Technology. *Business and Management*, 28(4), 147-149.
- [7] Abdulkhamitovna, F. M. (2023). Digitalization and the Competitive Advantages of Commercial Banks. *European Research Bulletin*, 19, 5-11.
- [8] Qin, Y. (2021). Research on the Transformation Strategy of Commercial Banks Based on the Development of Financial Technology. *Science & Technology Economy Market*, (4), 101-103.
- [9] Wang, S. (2021). Construction of a New Development Pattern for Digital Transformation of Commercial Banks. *Zhejiang Finance*, (5), 57-62.
- [10] Yan, F. (2021). Research on the Transformation and Development of Commercial Banks under the Background of Digital Economy. *Modern Business*, (07), 98-100. <https://doi.org/10.14097/j.cnki.5392/2021.07.030>
- [11] Sajid, R., Ayub, H., Malik, B. F., & Ellahi, A. (2023). The Role of Fintech on Bank Risk Making: Mediating Role of Bank's Operating Efficiency. *Human Behavior and Emerging Technologies*, 2023(1), 7059307. <https://doi.org/10.1155/2023/7059307>
- [12] Ouyang, W., & Lu, M. (2022). Comparison of Traditional Models and Digital Transformation Development of Small and Micro Finance in Commercial Banks. *Financial Theory and Practice*, (10), 45-56.
- [13] Latifovna, G. A. (2022). Digital Technologies in Commercial Banks. *EPR International Journal of Social Economy and Environmental Outlook*, 9(2), 5-9. <https://doi.org/10.36713/epra0314>
- [14] Ding, X. (2021). From Internet Finance to Digital Finance: Development Trend, Characteristics and Ideas. *Journal of Nanjing University*, (6), 28-44. <https://doi.org/10.3969/j.issn.1007-7278.2021.06.004>
- [15] Yu, J., & Wu, B. (2021). Digital Finance and Commercial Bank Risk-taking: An Empirical Study Based on Chinese Commercial Banks. *Industry and Economics Review*, 12(4), 108-128. <https://doi.org/10.14007/j.cnki.cjpl.2021.04.008>
- [16] Huang, Y., & Huang, Z. (2018). The Development of Digital Finance in China: Present and Future. *Economics (Quarterly)*, 17(4), 1489-1502. <https://doi.org/10.13821/j.cnki.ceq.2018.03.09>
- [17] Gomber, P., Koch, J. A., & Siering, M. (2017). Digital Finance and Fintech: Current Research and Future Research Directions. *Journal of Business Economics*, (5), 537-580. <https://doi.org/10.1007/s11573-017-0852-x>
- [18] Zhu, W. (2021). Analysis of Financial Technology and Digital Financial Risk Management. *Accountant*, (23), 46-48. <https://doi.org/10.3969/j.issn.1672-6723.2021.23.021>
- [19] Qian, H. (2022). Integrating Financial Technology into the Digital Development of Commercial Banks: Realistic Challenges and Solutions. *Modern Business*, (31), 143-146. <https://doi.org/10.14097/j.cnki.5392/2022.31.014>
- [20] Lin, B. (2022). Practice and Reflection on Digital Transformation of Commercial Banks. *Financial Zongheng*, (2), 3-10.
- [21] Yu, W., & Zhou, D. (2018). Internet Finance, Commercial Bank Scale and Risk-taking. *Journal of Yunnan University of Finance and Economics*, (1), 59-69. <https://doi.org/10.16537/j.cnki.jynufe.000267>
- [22] Boyd, J. H., & Nicolo, G. D. (2005). The Theory of Bank Risk Taking and Competition Revisited. *Journal of Finance*, 60(3), 1329-1343. <https://doi.org/10.1111/j.1540-6261.2005.00763.x>
- [23] Dell' Aricia, G., & Marquez, R. (2010). Risk and the Corporate Structure of Banks. *Journal of Finance*, 65(3), 1075-1096. <https://doi.org/10.1111/j.1540-6261.2010.01561.x>
- [24] Kong, D., & Dong, J. (2008). Empirical Analysis of the Impact of Corporate Governance Mechanisms on Commercial Bank Risk-taking. *Journal of Central University of Finance and Economics*, (11), 38-42. <https://doi.org/10.3969/j.issn.1000-1549.2008.11.008>
- [25] Wei, Y., & Qiu, L. (2022). Digital Finance, Asset Size, and Commercial Bank risk-taking. *Guizhou Social Sciences*, (6), 116-126. <https://doi.org/10.13713/j.cnki.cssci.2022.06.012>
- [26] Li, S., & Tian, G. (2020). Banking Competition and Banking Risk-taking Channel of Monetary Policy: Theoretical and Empirical Analysis. *Management World*, (4), 149-168. <https://doi.org/10.19744/j.cnki.11-1235/f.2020.0059>
- [27] Gu, H., & Yu, J. (2019). Uncertainty of China's Economic Policy and Bank Risk-taking. *World Economy*, (11), 148-171. <https://doi.org/10.19985/j.cnki.cassjwe.2019.11.008>
- [28] Jiang, H., Tang, S., & Wu, W. (2023). Research on the Impact of Digital Transformation on Commercial Bank Risk-taking: Theoretical Logic and Empirical Evidence. *International Finance Research*, (1), 62-73. <https://doi.org/10.16475/j.cnki.1006-1029.2023.01.006>

- [29] Zhai, S., Cheng, Y., & Xie, L. (2023). Digital Transformation and Risk-taking Level of Commercial Banks. *Journal of Beijing University of Business and Technology (Social Science Edition)*, 38(2), 75-86.
- [30] Guo, P., & Shen, Y. (2019). Internet Finance, Deposit Competition and Bank Risk Bearing. *Financial Research*, (8), 58-76. <https://doi.org/CNKI:SUN:JRYJ.0.2019-08-004>
- [31] Lv, M. (2020). Research on the Impact of Internet Finance Development on Risk-taking of Commercial Banks in China. [Master's thesis, Xinjiang University of Finance and Economics]. <https://doi.org/10.27428/d.cnki.gxcjc.2020.000267>
- [32] Meng, J. (2021). Research on the impact of Internet Finance on Commercial Banks' Risk-taking - Based on the Perspective of Market Competition. [Master's thesis, Nanjing University of Technology]. <https://doi.org/10.27241/d.cnki.gnjgu.2021.001986>
- [33] Zhai, K. (2019). Research on the Heterogeneous Impact of Internet Finance on Risk-taking of Small and Medium sized Commercial Banks in China. [Master's thesis, Yunnan Normal University]. CNKI.
- [34] Liu, Z. (2016). Research on the Impact of Internet Finance on Risk-taking of Commercial Banks. *Finance and Trade Economics*, (4), 71-85. <https://doi.org/10.19795/j.cnki.cn11-1166/f.2016.04.007>
- [35] Li, S., & Xu, Y. (2020). Internet Finance, Systemic Importance and Risk Bearing of Commercial Banks. *Macroeconomic Research*, (12), 38-46. <https://doi.org/10.16304/j.cnki.11-3952/f.2020.12.005>
- [36] Xu, C. (2022). Empirical Study on the Impact of Internet Finance on Commercial Banks' Risk-taking. [Master's thesis, Tianjin University of Commerce]. <https://doi.org/10.27362/d.cnki.gtsxy.2022.000017>
- [37] Guo, J., Liu, J., & Wang, L. (2022). Going Along with the Trend or Avoiding Disadvantages: the "Double-edged Sword" Effect of Internet Finance on Commercial Banks' Risk-taking. *Modern Finance and Economics (Journal of Tianjin University of Finance and Economics)*, (12), 63-76. <https://doi.org/10.19559/j.cnki.12-1387.2022.12.004>
- [38] Berg, T., Burg, V., Gombović, A., & Puri, M. (2020). On the Rise of FinTech: Credit Scoring Using Digital Footprints. *The Review of Financial Studies*, 33(7), 2845-2897. <https://doi.org/10.1093/rfs/hhz099>
- [39] Jin, H., Li, H., & Liu, Y. (2020). Financial Technology, Banking Risk, and Market Crowding out Effect. *Financial Research*, 46(5), 52-65. <https://doi.org/10.16538/j.cnki.jfe.2020.05.004>
- [40] Wu, Q. (2021). Research on the Impact of Financial Technology on Risk Undertaking of Commercial Banks. *Regional Finance Research*, (8), 47-55. <https://doi.org/10.3969/j.issn.1674-5477.2021.08.008>
- [41] Wang, J., Lou, Y., & Ding, W. (2022). Research on the Impact of Digital Consumer Credit on Risk Undertaking of Commercial Banks in China. *Zhejiang Finance*, (5), 26-35.
- [42] He, L., Feng, K., & Liu, Y. (2022). The Impact of Financial Technology Development on Commercial Bank Risk-taking. *Southwest Finance*, (08), 43-58.
- [43] Su, Q., & Yang, J. (2022). Financial Technology, Supply and Risk of Credit for Small and Medium-sized Banks and Small and Micro Enterprises. *Modern Economic Exploration*, (4), 43-60. <https://doi.org/10.13891/j.cnki.mer.2022.04.009>
- [44] Wang, R., Liu, J., & Luo, H. (2020). Fintech Development and Bank Risk-taking in China. *European Journal of Finance*, (2), 1-22. <https://doi.org/10.1080/1351847x.2020.1805782>
- [45] Qian, M. (2021). Research on the Impact of Financial Technology on Risk Undertaking of Commercial Banks - Index Construction Based on Text Analysis. [Master's thesis, Zhongnan University of Economics and Law]. <https://doi.org/10.27660/d.cnki.gzczu.2021.002414>
- [46] Liu, M., & Jiang, W. (2021). Does Fintech Exacerbate or Reduce the Risk-taking of Commercial Banks: Empirical Evidence from the Chinese Banking Industry. *Business Research*, (5), 63-74. <https://doi.org/10.13902/j.cnki.syyj.2021.05.008>
- [47] Wu, T., & Wang, R. (2021). Digital Finance, Bank Competition, and Bank Risk-taking: A Study Based on 149 Small and Medium-sized Commercial Banks. *Journal of Finance and Economics*, (3), 38-48. <https://doi.org/10.13762/j.cnki.cjlc.2021.03.004>
- [48] Wang, R., & Yang, S. (2022). Research on the Impact of Digital Finance on risk-taking of Commercial Banks: An Empirical Analysis Based on the Chinese Banking Industry. *Journal of Shanghai Lixin Institute of Accounting and Finance*, 34(1), 29-43. <https://doi.org/10.13230/j.cnki.jrsh.2022.01.009>
- [49] Liu, M., & Wang, Q. (2022). Research on the Impact Mechanism of Digital Finance on Commercial Bank Risk-taking. *Accounting and Economic Research*, 36(1), 86-104. <https://doi.org/10.16314/j.cnki.31-2074/f.2022.01.006>
- [50] Sun, G., & Jiang, W. (2021). Research on the Mechanism of the Impact of Digital Economy on the Non-Performing Loan Ratio of Commercial Banks. *Securities Market Introduction*, (5), 37-44.

- [51] Liu, Y., & Qin, H. (2022). Research on the Impact of Digital Finance Development on Risk Undertaking of Commercial Banks in China. *Western Finance*, (10), 10-17. <https://doi.org/10.16395/j.cnki.61-1462/f.2022.10.009>
- [52] Banna, H., & Alam, M. R. (2021). Does Digital Financial Inclusion Matter for Bank risk-taking? Evidence from the Dual banking System. *Journal of Islamic Monetary Economics and Finance*, 7(2), 401-430. <https://doi.org/10.21098/JIMF.V7I2.1320>
- [53] Liu, W., Liu, W., Dai, B., & Lv, T. (2022). Digital finance, loan structure, and commercial bank risk-taking: Analysis based on financial data from 181 commercial banks from 2011 to 2020. *Wuhan Finance*, (7), 30-41.



Copyright © 2024 by the authors. This is an open access article distributed under the CC BY-NC 4.0 license (<http://creativecommons.org/licenses/by-nc/4.0/>).

(Executive Editor: Wang-jing Xu)