Research on the Impact of Fin-Tech on Stock Volatility in the Artificial Intelligence Industry

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Abstract: With the continuous improvement of the economic level, the integration of finance and science and technology has become more and more extensive. Big data, cloud computing, block chain, artificial intelligence, and Internet of Things technology are rapidly developing and integrating into the financial sector. The development of the Artificial Intelligence industry is an important force in guiding the occurrence of a new round of technological revolution and industrial innovation. It is through the collection, processing, and handling of Internet databases, supported by powerful databases, and through intelligent algorithms, that a knowledge system is formed to provide corresponding results based on people's needs. The application of artificial intelligence technology in the financial sector has gradually become mainstream, and the development of fin-tech has also driven the rapid growth of the Artificial Intelligence industry.This article aims to study the impact of fin-tech on the stock volatility of the artificial intelligence industry. Using data related to the stock volatility of the artificial intelligence industry, this article empirically analyzes whether financial technology can promote the stock volatility of the artificial intelligence industry. The results show that the development of financial technology has a positive impact on the stock volatility of the artificial intelligence industry. The development of fin-tech can stimulate the development of the artificial intelligence industry and affect its stock volatility.

Keywords: Fin-tech, Artificial Intelligence Industry, Stock Volatility

1 Introduction

Fin-tech is a technological innovation that combines modern technology with the financial industry. With the rapid development of fin-tech, the development and rise of fin-tech in the financial field, with the use of big data, cloud computing, block chain, artificial intelligence, and Internet of Things technology, the business model and operation mode of the traditional financial industry have undergone radical changes, and the use of artificial intelligence technology in the financial field has become more and more extensive, covering risk management, intelligent investment, customer service, anti-fraud and other Many fields.

In this context, studying the impact of fin-tech on the volatility of stocks in the artificial intelligence industry can provide stakeholders with a better reference for decision-making. The rise of fin-tech has led to changes in the risk characteristics of the financial market. Understanding the mechanism of fin tech's effect on the volatility of stocks in the AI industry enables investors to more accurately assess the risk and reward, and thus make more informed investment decisions; helps financial institutions to efficiently identify and control the possible

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risks and maintain the stability of the stock price; and helps to promote the sustainable growth of the fin-tech and AI industries,. At the same time, it also ensures the fairness and transparency of the market; the government and regulatory authorities can formulate policies and regulations that are more in line with the current needs based on these research results.

2 Theoretical foundations

Itay Goldstein, Wei Jiang et al. (2019) state that fin-tech is the convergence of finance and technology, that technology has always impacted the financial industry, and that new technologies are being introduced at a faster rate than ever before[1]. Rita A G ,Amanda M B ,Saleh S , et al. (2023) analyze consumer decision-making on artificial intelligence's reactions and found that for personal loans, consumers are more satisfied with the rejection of AI providers compared to credit analysts[2].

Li Chuntao and Yan Xuwen et al. (2020) utilized the data of listed companies on the New Third Board from 2011 to 2016,and examined the impact of fin-tech development on corporate innovation.The results showed that fin-tech development significantly promoted corporate innovation[3]. Yang Meidan (2023) investigates the impact of fin-tech development on stock market volatility by establishing a GARCH-M model, and the results show that fin-tech exacerbates the volatility of China's stock market[4]. Fang Yi, Chen Yuzhi et al. (2022) study the quantitative application of artificial intelligence in China's financial market, which can be used to optimize investment portfolios and improve the overall level of investor returns[5]. Yu Chunxia and Man Ru (2020) selected AI concept stocks of China's A-shares from 2013 to 2018 to conduct empirical research. The research results show that the proposed dynamic evaluation method of investment value can better screen out AI companies with excellent performance, and then help investors make decisions[6].Chen Yuan (2020) believes that fintech helps the financial industry cultivate new advantages, play new roles, and achieve new development, which is conducive to optimizing the way of financial services[7].

Duan et al. (2019) discussed the possibility that AI may replace human decision-making and explored its impact on managing organizational decision-making. In addition, other research literature has studied the prospects of AI applications from the perspectives of technical methods and privacy protection, which has had a profound impact on the development of AI and related industries[8]. Daniel (2023) points out that fintech has played a positive role in mitigating the negative impact of the pandemic and accelerated consumer adoption of fintech and digital payment methods[9]. FS Rasiwala, B Kohli (2021) believe that the traditional financial industry is facing digital disruption brought by the application of artificial intelligence[10]. Ruslan M H A R ,Ibrahim A M ,Hamid A H N(2022) proposed that the rapid development of financial technology and the increasing application of AI in the financial industry have made more young investors use investment advisors to make decisions, and tend to invest in digital platforms[11]. Breidbach (2019) proposed that due to the rapid development of financial technology, it has provided new business models and technological solutions for the financial industry, and has also fundamentally changed the operation mode of traditional finance, continuously impacting the original structure of the financial market[12].

Fin-tech has positively impacted the way financial institutions and consumers pay and accelerated digital transformation. Fin-tech is an important part of the new infrastructure in

modern financial management, and artificial intelligence technology is one of the key supporting technologies of Fin-tech. The development of Fin-tech will have a certain impact on the stock market of the AI industry, and further in-depth research is needed to study the impact of Fin-tech on the volatility of the stock market of the AI industry, as well as to strengthen the research on the risks and challenges posed by Fin-tech.

3 Status

3.1 Current status of fin-tech development

3.1.1 Scale of Fin-tech development

The development of fin-tech in China is in a state of rapid growth. In 2015, the development of third-party payment applications promoted the development of online financial industry services, a large number of financial institutions began to promote Internalization, and fin tech-related enterprises began to develop, ushering in the entrepreneurial climax of fin-tech enterprises. As can be seen in Figure 1. below, the scale of the number of main bodies in China's fin-tech industry reached 48,260,000 in 2015, with a growth rate of 79%, and the number of fin-tech enterprises in the following years is also increasing, and as of now, the total number of fin tech-related companies in China has reached nearly 40 times of that of the previous ten years, and the scale of development is expanding continuously.

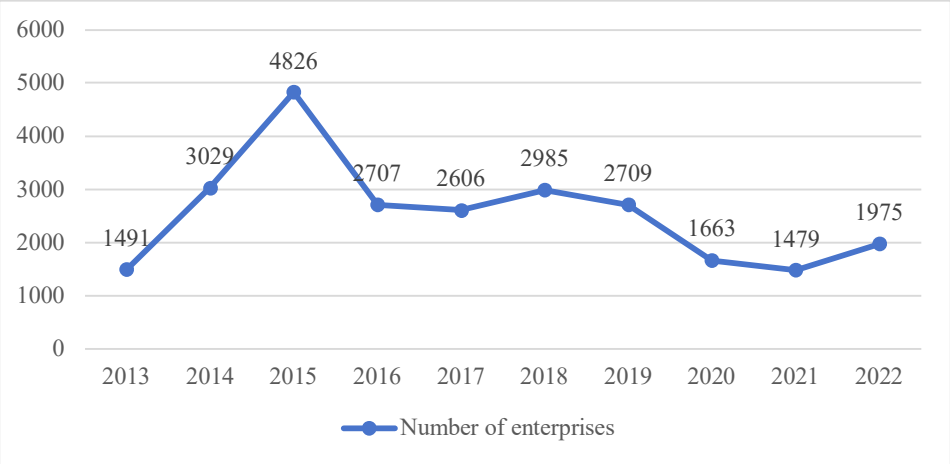

Figure 1. Scale of the number of subjects in China's fin-tech industry, 2013-2022 Unit: 10,000.
Source: Prospective Research Industry Institute

As can be seen in Figure 2. the market size of the Fin-tech industry is expanding, showing a rising trend, from $263.4 billion in 2017 to $542.3 billion in 2023. Through 6 years, the size of Fin Tech's development rose to more than double its original size,. In 2020, because of the epidemic, most people choose to use the Internet to realize financial transactions, which brings the possibility of online development for financial development, and brings new opportunities and challenges for the development of financial technology.

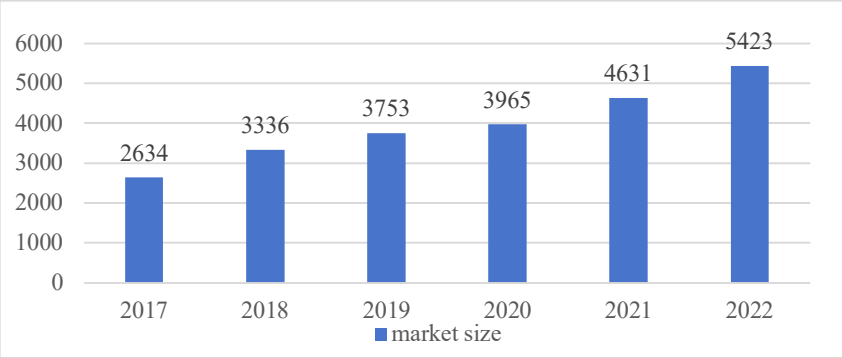

Figure 2. Market Size of China's Fin-tech Industry, 2017-2022 Unit: billion yuan.
Source: Prospective Research Industry Institute

3.1.2 Distribution of fin-tech companies

From the perspective of the distribution of fin-tech cities, most of the fin-tech enterprises are distributed in four cities, Beijing, Shanghai, Shenzhen and Guangzhou, which are the main high-tech industrial zones in China, and the number of fin-tech enterprises in the four cities accounts for 80% of the number of fin-tech enterprises in China. As can be seen in Figure 3., Beijing has the highest percentage of Fin-tech enterprises at 43%, Shanghai and Shenzhen's enterprise data is flat at 16% in 2023, and the percentage of Fin-tech enterprises in Guangzhou is 7%. In addition to the four cities of Beijing, Shanghai, Shenzhen and Guangzhou, Hangzhou and Chengdu are also gradually developing, and the center of China's fin-tech enterprise development is gradually unfolding.

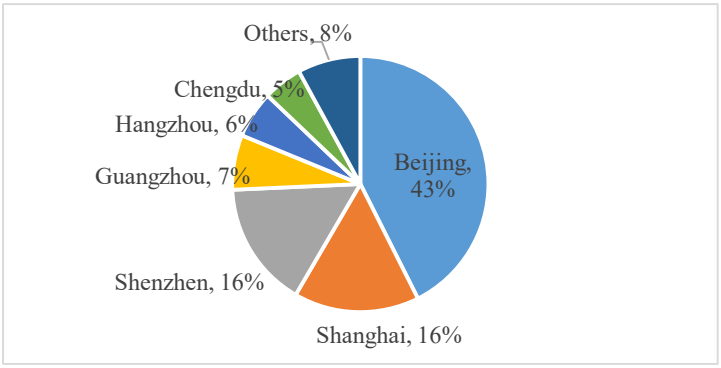

Figure 3. Distribution of Fin-tech Companies in China, 2023.
Source: China Fin-tech Chief Insight Report

3.2 State of the Artificial Intelligence Industry

3.2.1 Artificial Intelligence Business Development Overview

Although China's artificial intelligence industry started late, it has developed rapidly under China's policies and technical support. China's 13th Five-Year Plan proposes to incorporate the

development of artificial intelligence into the country's development plan, and the 14th Five-Year Plan proposes to focus on the development of digital information technology and vigorously promote the application of artificial intelligence in many public areas such as healthcare and sanitation. China's "13th Five-Year Plan" proposes to incorporate the development of artificial intelligence into the national development plan, and the "14th Five-Year Plan" proposes to focus on the development of digital information technology, and vigorously promote the application of artificial intelligence in many public areas such as medical care and health.

People's demand for AI products is increasing, while the strength of the smart industry is gradually increasing, China's AI industry has made important breakthroughs in key core technologies such as smart chips and open-source frameworks, and has continued to enhance the innovation capacity of smart chips, terminals, robots and other iconic products, and the scale of its core industry is also expanding. The development of the core scale of China's AI industry can be seen in Figure 4., where the core industry scale of China's AI has developed from 263.4 billion yuan in 2019 to 508 billion yuan in 2022, showing a high-speed upward trend under the combined effect of technology, market and policy.

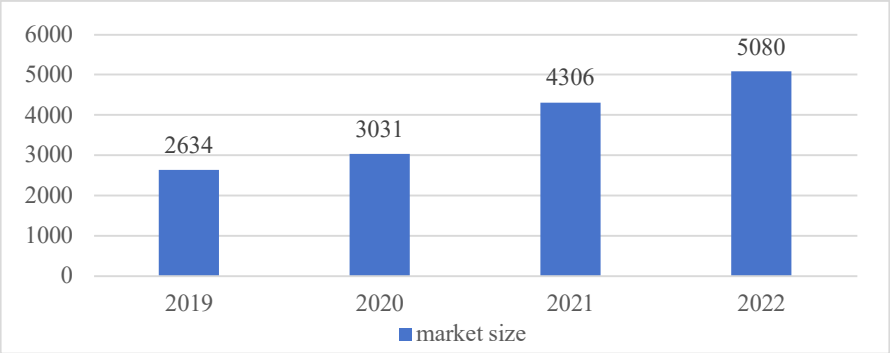

Figure 4. Statistics of the Core Scale of China's Artificial Intelligence Industry in Billions of Yuan, 2019-2022.
Source: China Business Information Network

The rapid development of financial technology, because of which there is the application of artificial intelligence technology, so the degree of market competition and its market share will also affect the performance of the artificial intelligence industry and the price of the stock; artificial intelligence technology in financial technology has an important role in the identification and processing of customer information, and in the prevention of fraud, etc., and the scope of its application is gradually expanding; the new business model generated by the innovation of financial technology to the Internet as a platform, breaking the traditional payment mode, generating online lending and other ways to seize the market share; the traditional financial industry's regulatory system has the problems of coverage and high cost, and under the influence of artificial intelligence technology, a more sound regulatory system will be established, and the application of artificial intelligence technology in the development of financial technology is very important, and its development can lead to the development of the artificial intelligence industry, causing its volatility impact of stocks.

4 Empirical analysis

4.1 Variable Setting and Description

Stock volatility (VAR_ADJ_{it}) , which is measured in this paper by the variance of a firm's stock price returns, with a higher variance of stock price returns indicating higher stock volatility. (VAR_ADJ_{it}) denotes the average of the variance of each monthly stock return from May of firm i in year t to April of year t+1 , after market adjustment, the monthly stock return variance is equal to the variance of daily individual stock returns during the month multiplied by the number of trading days in the month (multiplied by 100), the greater the stock volatility, the more volatile the stock.VAR_ADJ_{it} The larger it is, the more volatile the stock is.

The level of fin-tech development ($Fintech_{it}$), referring to Li Chuntao (2020) in China Industrial Economy, the text mining method is utilized to construct a fin-tech index matching prefecture-level cities and municipalities directly under the central government, as follows:

(1) Extracting Fin-tech keywords. According to “the13th Five-Year Plan of National Science and Technology Innovation” and “China Fin-tech Operation Report” as well as relevant news and important conferences, 48 keywords related to fin-tech are extracted from them, including EB-level storage, NFC payment, differential privacy technology, big data, third-party payment, multi-party secure computing, Distributed Computing, Equity Crowdfunding and Financing, Internet Finance, Machine Learning, Open Banking, Brain-like Computing, Quantitative Finance, Streaming Computing, Green Computing, In-Memory Computing, Block chain, Artificial Intelligence, Cognitive Computing, Converged Architecture, Business Intelligence, Identity Verification, Deep Learning, Biometrics, Data Visualization, Data Mining, Digital Currencies, Investment Decision Aid Systems, Graph Computing, Image Understanding, Net Links , Text Mining, Internet of Things, Information Physical Systems, Virtual Reality, Mobile Internet, Mobile Payment, Billion Level Concurrency, Heterogeneous Data, Semantic Search, Speech Recognition, Cloud Computing, Credit Collection, Intelligent Financial Contracts, Intelligent Customer Service, Intelligent Data Analytic, Intelligent Investment Advisors, Natural Language Processing, totaling 48 keywords.

(2) Keyword Baidu News Advanced Search. By matching China's prefecture-level cities and municipalities directly under the central government with the above keywords, 48 keywords are matched with 300 cities, and searching for the year's prefecture-level city or municipality directly under the central government plus keywords at the Baidu advanced search, to build search terms, such as “Beijing + block chain”, “Beijing + NFC payment” Based on the search terms, we can get the number of web pages containing “Beijing + block chain”, “Beijing + NFC payment”.

(3) Crawling the advanced search results of Baidu news. Crawl the web page source code and sum up the search results, count the search volume of all keywords in each city, log the total search volume, construct the fin-tech development level index, save all the retrieval results, the search volume of each keyword, and the index of the fin-tech development level, because the index is a prefecture-level city index, so synthesize the provincial-level fin-tech development level index by taking the mean value, and log the fin-tech index.

In this paper, asset size, market return and turnover rate are chosen as control variables, the different year-end total assets of the company represent the value of the company and different

stock market capitalization, the market return rate is used to understand the development of the whole market, and the turnover rate can be used to understand the situation of the strength of the stock's liquidity. The meanings of the control variables are as follows:

(1)Firm size (Size): In this paper, we choose the year-end total assets of the firms obtained from the CSMAR database, and in order to eliminate heteroskedasticity, the logarithm of the year-end total assets is chosen.

(2)Average Market Return (AVE): In this paper, we use the stock returns of the Shanghai and Shenzhen stocks that are components of the AI sector. The CSMAR database is used to obtain data such as the closing points of the stocks. The specific formula is as follows:

(3)Stock Turnover Ratio (TUR): Generally used to describe the strength of a stock's liquidity over a period of time to reflect its liquidity. The stock turnover rate is reflected by the current stock trading volume and the number of shares outstanding in the market. In this paper, the data of stock turnover rate can be obtained directly through CCER database.

In this paper, the Shanghai and Shenzhen stocks among the constituents of the AI sector in 2011-2021 are selected as the research sample, and the constructed provincial fin-tech development level index in 2011-2021 is used, so the sample interval is 2011-2021. Among them, the data of the explanatory variable stock volatility, as well as the data of the control variables market return rate and turnover rate are from the CCER database, the data of the control variable enterprise size are from the CSMAR database, and the explanatory variable fin-tech development level index is from Baidu news search. And the samples are treated as follows:

(1) Remove samples with incomplete data and outliers;

(2) Delete the ST, PT and delisted samples;

There are a total of 223 listed companies in the AI industry, and the data chosen for this paper is annual, with a total of 1,930 pieces of data.

4.2 Modeling

This paper addresses whether Fin-tech has an impact on stock volatility in the AI industry, and it constructs a panel model as follows:

$$VAR\_ADJ_{it} = \alpha + \beta_1 Fintech_{it} + \beta_2 Size_{it} + \beta_3 AVE_{it} + \beta_4 TUR_{it} + \varepsilon_{it} \quad (1)$$

4.3 Empirical evidence process

4.3.1 Descriptive statistics

According to Table 1., a total of 1930 data were obtained, and a total of six indicators, namely, stock volatility before market adjustment (VAR) and stock volatility after market adjustment (VAR_ADJ), fin-tech index (Fin-tech), turnover rate (TUR), market return (AVE), and firm size (Size) were selected for the descriptive statistics, and the results are shown in Table 1.

Table 1. Descriptive statistical analysis.

variant	observed value	average value	(statistics) standard deviation	minimum value	upper quartile	maximum values
VAR_ADJ	1930	1.395	0.962	0.197	1.129	9.425
VAR	1930	1.969	1.372	0.349	1.558	10.638
Fintech	1930	0.136	0.044	-0.037	0.146	0.201
AVE	1930	0.182	0.736	-0.806	0.000	7.149
Size	1930	22.143	1.548	0.259	22.052	26.832
TUR	1930	6.353	5.411	0.000	4.903	46.361

Source: analysis results of Stata

4.3.2 Unit root test

In order to avoid the problem of pseudo-regression in the panel data, the data need to be tested for unit root. In this paper, we choose to use the p-value of the Fisher-type test result to determine whether to reject the original hypothesis of unit root. The original hypothesis of this test is the existence of a unit root, if the p-value is less than 0.05, it means that the original hypothesis is rejected, there is no unit root, and the data is smooth, according to the Table 2. below, we can see that all the p-values are 0.0000, which means that there is no unit root, and the data is with smoothness.

Table 2. Unit root test results.

	statistic	P-value
VAR_ADJ	1190.9310	0.0000
VAR	1237.4797	0.0000
Fintech	1103.4499	0.0000
Sive	671.8843	0.0000
AVE	1149.3001	0.0000
TUR	1150.2078	0.0000

Source: analysis results of Stata

4.3.3 Hausman test

In order to determine whether the model in this paper uses a random effects model or a fixed effects model, a Hausman test is required to determine this. The original hypothesis of the Hausman test is the random effect model and the alternative hypothesis is to choose the fixed effect model, as can be seen in Table 3. the P-value is 0.0001, so the original hypothesis is rejected and the alternative hypothesis is chosen to perform the regression analysis using the fixed effect model.

Table 3. Hausman test results.

	Coefficient
Chi-square test value	26.44
P-value	0.0001

Source: analysis results of Stata

4.3.4 Benchmark regression analysis

As shown in Table 4., the coefficient of the core explanatory variable Fin-tech (Fin-tech) is positive and significant at the 1% level of significance, and the coefficient of Fin-tech (Fin-tech) is 4.576, which indicates that every one unit increase in the Fin-tech index increases the stock volatility of the AI industry by 4.576, which is positively promoting it, indicating that the development of Fin-tech will promote the development of the artificial intelligence industry, and the larger the fin-tech index, the greater the impact on the stock volatility of the artificial intelligence industry. Among them, the coefficient of the control variable enterprise size (Size) is negative and significant at 5% significant level, indicating that the enterprise size will have a negative impact on stock volatility, while the turnover rate (TUR) is significant at 10% significant level with a positive coefficient, and the market rate of return (AVE) is significant at 1% significant level with a positive coefficient, indicating that the turnover rate and the market rate of return will have a positive impact on stock volatility. impact, i.e., the greater the turnover rate and market return, the greater the volatility of the stock.

Table 4. Benchmark regression results.

Variable	Results
Fin-tech	4.576***
	(2.63)
Size	-0.071**
	(-2.28)
AVE	0.512***
	(9.78)
TUR	0.011*
	(1.70)
Constant	2.173***
	(2.98)
Observations	1,930
R-squared	0.523
Individual fixation	YES
fixed time	YES

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: analysis results of Stata

4.3.5 Robustness Tests

As seen in the above benchmark regression results, it is proved that Fin-tech has a positive role in promoting the AI industry, and in order to ensure the robustness of the results, it is necessary to carry out a robustness test, and this paper adopts the replacement of the explanatory variables to carry out the robustness test. The original market-adjusted stock volatility (VAR_ADJ_{it}) is replaced with the non-market-adjusted (VAR_{it}), the study continues to examine whether Fin-tech has an impact on stock volatility in the AI industry.

As can be seen from Table 5., after replacing the explanatory variables, the coefficient of the Fin-tech index is 4.523 is positive and significant at the 5% confidence level, which indicates that Fin-tech has a significant positive impact on stock volatility in the AI industry, and the main conclusions do not change, thus showing the robustness of the previous conclusions.

Table 5. Robustness test results.

Variable	Results
Fintech	4.523**
	(2.32)
Size	-0.024
	(-0.76)
AVE	0.512***
	(9.00)
TUR	0.026***
	(3.74)
Constant	1.630**
	(2.15)
Observations	1,930
R-squared	0.711
Individual fixation	YES
fixed time	YES

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: analysis results of Stata

5 Conclusion

The rapid development of fin-tech has a significant impact on the stock volatility of the artificial intelligence industry, this paper examines the study of the impact of fin-tech on the stock volatility of 223 artificial intelligence companies, through the descriptive statistics of the collected data, unit root test, selecting with Hausman test to use the fixed effect model, doing regression analysis, and robustness test for interpretation, and the final empirical results illustrate the positive impact of fin-tech on the stock volatility of the Artificial Intelligence industry's stock volatility has a positive contribution, the development of Fin-tech will have a boost to the Artificial Intelligence industry, due to technological advances, improve efficiency, cost savings, and bring about fluctuations in the industry's stock prices. The rapid development of financial technology has increased the demand for the use of artificial intelligence technology in the financial sector, bringing great room for progress in the development of the artificial intelligence industry.As the use of financial technology in the artificial intelligence industry becomes more and more in-depth, it may face certain challenges and risks, and we need to take certain measures to solve these problems.

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