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Institutional Investors and Stock Price Crash Risk

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Abstract

This study conducted a profound analysis of the impact of external corporate governance, focusing on the characteristics of institutional investors, on stock price crash risk. A total of 21,642 annual sample observations from the listed companies in China's A-share market from 2004 to 2021 were selected as the research data. The results showed that the increase in shareholding ratio of institutional investors among the shareholders of listed companies significantly increased the risk of a stock price crash. Moreover, a higher stability among institutional investors correlated with a higher inclination among companies to conceal negative news, thus increasing the risk of a stock price crash. However, herd behavior among institutional investors did not impose a significant impact on the stock price crash risk among the overall samples. In listed companies with qualified foreign institutional investors holding shares, institutional investors increased the risk of stock price collapse and exacerbated the crash risk of stock prices. The results challenge the role of institutional investors as "supervisors" and provide new evidence for research on the influence of institutional investors in the capital market.

Key words: External Corporate Governance; Stock Price Crash Risk; Institutional Investors

1 Introduction

Stock price crash risk refers to a risk of a sharp decline in stock prices over a relatively short period of time. This situation typically occurs under the influence of various factors, such as drastic market fluctuation, severe economic environment, internal corporate problems, and changes in market sentiment. Stock price crash risk may cause losses to investors, lower market liquidity, and increase uncertainty in the entire market. Institutional investors play an important role in the capital market by improving information flow, enhancing market transparency, ugrading corporate governance, and promoting market supervision. These investors manage large amounts of funds and represent many small and medium-sized investors (e.g., pension funds, hedge funds, publicly offered funds, investment banks, insurance companies). Meanwhile, all listed companies are subject to external corporate governance, in which external authorities, such as regulatory bodies, the government, media, and public, supervise, regulate, and impact microcosmic entities (Weir et al., 2002; Kim et al., 2011; Bharath, 2019). In this study, we explored the impact of external corporate governance on stock price crash risk.

Currently, the structure of investors in China's A-share market has become less dominated by retail investors, and an era of "institutionalization" is gradually emerging[1]. The China Securities Regulatory Commission has also encouraged and advocated the "unconventional and creative cultivation and development of institutional investors" and successively released a series of policies and measures to support and standardize this practice, benefiting from which the shareholding ratio of institutional investors continued to grow. By the end of 2022, according to the data released by the CSRC, the ratio of the institutional investors' free float market cap had increased to 56.7% in China's A-share market.

Scholars hold different views regarding the impact of institutional investors on external corporate governance. Institutional investors actively participate in corporate operation and management. Their functions of supervision and governance have been deemed by scholars from Western developed countries as crucial in mitigating agency problems and strengthening corporate governance. As mature and rational investors in the capital market, institutional investors own tremendous capital advantages and employ professional technical teams, which

[1] For the detailed report, please refer to https://www.stcn.com/article/detail/500460.html

enable them to function effectively as “supervisors” by means of active utterance (voting by hand), exit threat (voting by foot), and market survey. As such, they can control misconduct in managers. For example, institutional investors may reduce the management’s earnings management behaviors initiated for self-interest motives (Cornett et al., 2008) or replace CEOs with unfavorable performance (Kang et al., 2018).

Some scholars have raised their doubts on the governance effect of institutional investors, given that the profit-driven nature of institutional investors makes them prioritize the inflow of investment funds over corporate performance. In particular, trade-oriented institutional investors who focus on short-term returns are more inclined to change investment targets frequently and maintain shorter shareholding periods. In this case, they are less motivated to participate in corporate governance (Jiang & Kim, 2015; Firth et al., 2016). Moreover, institutional investors may become “cooperators,” conspiring with the management and exacerbating information asymmetry between investors and companies, resulting in increased agency conflicts and decreased supervision and restriction of the operation management of listed companies.

In consideration of the foregoing, we adopted the risk of a stock price crash as a specific research object to profoundly explore the effect of the external corporate governance of institutional investors in China’s A-share market and analyze the role of institutional investors in the stock market as “supervisors” or “cooperators.” We expected our findings to provide novel insights for investors and for the market supervision of the government in reevaluating institutional investors.

2 Literature Review

2.1 External Corporate Governance of Institutional Investors

The external corporate governance of institutional investors refers to the effect of large institutional investors (e.g., pension, publicly offered, and hedge funds) on the behaviors of companies in which they hold shares. With the continuous expansion of the scale and influence of institutional investors, their role in corporate governance has sparked extensive discussion. Currently, the effect of the external corporate governance of institutional investors is

controversial in academic circles. One view is that institutional investors, as holders of corporate shares, would supervise internal corporate governance and relevant corporate behaviors on behalf of minority shareholders, thereby benefiting the long-term sustainable development of these companies. Another view holds that the primary purpose of institutional investors is to gain interest by purchasing and selling assets (stock) in the capital market. As such, they will not perform the function of supervision nor truly participate in corporate governance. We discussed these two competing views, to explore the contribution margin.

With respect to the former view that supports the effects of external corporate governance of institutional investors, many scholars have discussed the governance motive, methods, and performance of institutional investors from multiple dimensions. First, the motive of institutional investors for governance mainly originates from financial income. Lewellen et al. (2022) found that the motive of institutional investors to participate in corporate governance is to increase the capital inflows managed by these institutions by improving the corporate value, thereby bringing better returns on investments to the institutional investors.

Second, institutional investors typically adopt two corporate governance methods, namely, active utterance (voting by hand) and exit threat (voting by foot). Diversified strategies are available for active utterance, including private negotiation, public censure, voting by proxy, and shareholder litigation. Carleton et al. (1998) investigated letters of pension funds and found that these funds privately negotiate with the companies in which they held shares to participate in governance. McCahery et al. (2016) gathered statistics on institutional investors' survey reports and proved that they participate in corporate governance; they further found that institutional investors participate in corporate governance by adopting the strategy of active utterance rather than exit threat. For example, institutional investors set meetings with the management and publicly denounce the misconducts and unfavorable performance of enterprises. Aggarwal et al. (2015) reported that institutional investors participate in corporate governance through voting by proxy. Cheng et al. (2010) found that institutional investors, as lead plaintiffs in litigation, better facilitate defendant companies to make improvements after litigation, indicating that institutional investors may also improve corporate governance by means of litigation. Jiang et al. (2018) revealed that institutional investors significantly improve their corporate governance capacity through on-the-spot surveys, and this effect is more

prominent in companies with relatively low information environment quality and inferior corporate governance. With respect to relevant research on the exit threat, Parrino et al. (2003) asserted that institutional investors participate in corporate governance through voting by foot, and the shareholding ratio of institutional investors tends to decline drastically after a forced CEO change, which is a way to express their dissatisfaction with the management.

Third, regarding governance performance, the impact of institutional investors on corporate governance and corporate behaviors may be explored from multiple perspectives, including shareholding characteristics and types of institutional investors. Hartzell et al. (2003) found a correlation between the ownership centralization of institutional investors and the sensitivity of senior managers' remuneration. Moreover, the former is negatively correlated with the remuneration level, indicating a role of "supervisor" played by institutional investors in the mitigation of agency problems between shareholders and the management. Cornett et al. (2008) reported that the increase in shareholding ratio of institutional investors reduces the management's earnings management behaviors initiated for self-interest motives, which demonstrates the supervisory function of institutional investors. Kim et al. (2011) suggested that the equity ratio of CEOs and the positive effect on risk taking may be weakened when the ownership centralization of institutional investors is high, indicating the restricting effect of institutional investors' supervision on the management's behaviors. Kang et al. (2018) pointed out that institutional investors who serve as substantial shareholders tend to improve the governance effect. When these institutional investors hold a higher equity ratio in companies, they are inclined to replace CEOs with unfavorable performance, and consequently, the corporate performance improves after the CEO change. Dyck et al. (2019) analyzed data from 41 countries and demonstrated that the ownership of institutional investors is positively correlated with the performance of corporate social responsibility, with their motive originating from the dual effect of economy and society. He et al. (2019) suggested that cross-shareholding motivates institutional shareholders to play a more active supervisory role, as specifically reflected in the positive correlation of cross-shareholding with the voting of institutional investors against governance proposals initiated by management shareholders, resulting in the loss of the latter's decision-making rights. Crane et al. (2019) confirmed that the connection between investors can be improved and corporate governance can be strengthened upon the

common shareholding of institutional investors; the increase in their common shareholding ratio contributes to the increase in votes cast against low-quality management reports.

Regarding the different types of institutional investors, Chen et al. (2007) concluded in their research on merger and acquisition (M&A) performance that institutional investors who adhere to long-termism play their supervisory role better, as reflected in the better performance of companies with this type of institutional investors after the M&A and the higher possibility of the withdrawal of bad mergers and acquisitions. Ferreira et al. (2008) used data on listed companies in 27 countries and argued that institutional investors less involved in corporate business (e.g., foreign-funded and independent institutional investors) have a stronger effect on corporate supervision, reflected in the higher valuation, better operating performance, and lower capital expenditure of companies in which these institutional investors hold a higher shareholding ratio. Bena et al. (2017) also found that foreign institutional investors do not simply focus on short-term income, and that the increase of their shareholding ratio can improve the investments of enterprises in intangible assets, tangible assets, and human capital, as well as promote the output of innovation achievements and make enterprises go global. Huang et al. (2015) studied the reform of non-tradeable shares in China and confirmed that the influence of qualified foreign institutional investors (QFIIs) on state-owned shareholders tends to be greater compared with local mutual funds because of a lower vulnerability to political influences and higher likelihood of participating in the fair negotiation and supervision of state holding companies. Brav et al. (2008) suggested that hedge funds participate in corporate governance and the target companies' performance and CEO remuneration change even significantly after fund intervention, together with the changes in the enterprises' stock dividend policies. Appel et al. (2016) indicated that passive mutual funds influence the choices of corporate governance, including the hiring of more independent directors, reduction of takeover defense, and construction of more equal voting rights to improve long-term corporate performance. Borochin et al. (2017) indicated that long-term institutional investors contribute fewer misguided valuations of companies and better governance effects compared with short-term institutional investors.

With respect to questions on the effect of external corporate governance of institutional investors, Bebchuk et al. (2017) proposed that a principal–agent problem exists between

investor managers from institutional investors and actual investors; investment managers might make the actual investors suffer investment losses to pursue their own interests. They also found that the principal–agent problem in hedge funds might be insignificant compared with passive index and active mutual funds. Schmidt et al. (2017) suggested that the positive exogenous impact of the ownership of passive index funds may result in the increase of the CEO's power, reduction of the appointment of independent directors, and decline of M&A quality. These results indicate that the increase in equity held by passive institutional investors will lead to the rise of the principal–agent cost. Heath et al. (2022) indicated that the supervisory effect of passive funds is worse compared with active funds. Passive funds are unlikely to vote against the management of the companies regarding disputed governance issues, which then results in the decline of the independence of the board of directors and sensitivity to the remuneration performance.

2.2 Factors Triggering Stock Price Crash Risk

The triggers of stock price crash risk may be deliberated from the internal and external factors of enterprises. Based on existing theories, the internal core factors of enterprises that contribute to their stock price crash risk lie in the management's hoarding and concealment of negative news. Therefore, research has investigated how the internal factors of enterprises, including corporate behaviors, management behaviors and characteristics, remuneration and welfare system, and stock characteristics, potentially trigger the risk of a stock price crash.

From the perspective of corporate behaviors, research indicates that factors like tax behavior, decision-making on innovation, decision-making on investment, social responsibility disclosure, and earnings management can increase the risk of a stock price crash. These behaviors are adopted by management to cover negative news. Alternatively, the management may overestimate the corporate value to pursue their own interests, thus leading to the accumulation of negative news and finally causing stock prices to plummet.

Kim et al. (2019) used samples of American companies and proved that enterprises' tax avoidance increases the risk of a stock price crash, because tax avoidance, as an opportunistic behavior, can lead to the management's corruption and the accumulation of negative measures. Once the concealed negative news accumulatively exceeds a critical point, the release of

negative news hoarded for a long period will result in a stock price crash.

Regarding decision-making on innovation, Zhou et al. (2017) found that the innovation investment of GEM-listed companies is negatively correlated with stock price crash risk—investors' attention to enterprise innovation can increase the flow and transparency of information. Jia et al. (2018) studied the relation between enterprise innovation strategies and future stock price crash risk, and found that enterprises with explorative innovation strategy are more vulnerable to stock price crash compared with development-oriented innovation strategy. The explorative innovation strategy indicates subversive exploration and innovation of previous technology, making the failure rate of innovation higher. Consequently, the enterprises' motive to disclose negative news related to the innovation project is reduced, resulting in a stock price crash.

From the perspective of decision-making on investment, Jiang et al. (2015) indicated that enterprises' overinvestment can aggravate the stock price crash risk, arising from a principal–agent problem. In other words, the management overinvests to seek private interest, leading to the overestimation of the actual value of the enterprise and eventually causing plummeting stock prices. Peng et al. (2018) constructed a triangular game model containing market, company, and manager; they found that enterprises' financial investment increases the possibility of a stock price crash when the management will hold financial assets with favorable liquidity to cover the negative news. In other words, the higher the financial investment level of an enterprise, the higher the degree of information asymmetry with the outside world.

Meanwhile, Quan et al. (2015) reported that corporate social responsibility disclosure positively impacts the risk of a stock price crash. Enterprises disclose reports mandatorily, and some tend to cover up misconducts by disclosing social responsibility information, thus resulting in the concealment and accumulation of negative news.

Research has also noted that earnings operation is an important behavior that affects enterprises. Hutton et al. (2009) used earnings management as an indicator to measure the transparency of corporate financial statements, proving a positive correlation between opacity and stock price crash risk. However, the adoption of the Sarbanes–Oxley Act may, at least in the US, help improve this negative impact, indicating that regulatory policies benefit the reduction of the accumulation of negative news to realize the goal of preventing a stock price

crash. Chen et al. (2017) found that the higher the degree of income smoothing in an enterprise, the greater the stock price crash risk, indicating that earnings smoothing also provides opportunities for the management to manipulate financial information. Notably, the management would conceal negative news in consideration of their position and remuneration.

From the perspective of the management's behaviors and characteristics, the risk of a stock price crash is positively affected by shareholding reduction of senior managers and substantial shareholders, management overconfidence, and management age. Zhang et al. (2017) analyzed the desterilization of non-tradable shares and found that substantial shareholders increase stock prices and reduce shareholding at a high level through capital operation after desterilization, exacerbating the stock price crash risk. Sun et al. (2017) reported that senior managers' reduction of shareholding has a significantly positive impact on the stock price crash risk, with shareholding reduction being a signal of the management's suppression of negative news. When the negative news accumulates to a certain extent, one potential outcome is a stock price crash. Yi et al. (2019) pointed out that the peer effect of senior managers' shareholding reduction can significantly increase the risk of a stock price crash. Although insiders may not conceal negative news during the period of shareholding reduction, external investors can lower the stock prices to seek risk compensation, given that shareholding reduction can intensify the separation of interests with external investors, thus increasing the stock price crash risk.

Kim et al. (2016) demonstrated that overconfidence makes CEOs overestimate the returns of investment projects and neglect the feedback of privately acquired negative news, resulting in the accumulation of unfavorable performance and increasing the possibility of a stock price crash. Andreou et al. (2017) found that CEO age has a significantly positive impact on the risk of a stock price crash: young CEOs are more likely to hoard some negative news for the purpose of self-interest and career success in the early stage. This negative effect is even more significant in companies with ineffective management supervision.

From the perspective of remuneration and welfare system, research has explored the impact of senior managers' option system and allowance and welfare system on stock price crash risk. Kim et al. (2011) found that the value of option portfolios of CFOs significantly improves the stock price crash risk of companies. The effect is more obvious in companies

with high financial leverage in non-competitive industries. Their research indicated that senior managers will conceal negative news if the stock prices are closely related to their interests. Benmelech et al. (2010), using a dynamic rational-expectation model featuring information asymmetry, indicated that stock-based compensation incentives induce managers, including CEOs, to conceal negative news regarding the influence on the future growth of options and choose next-best investment decisions, leading to the overestimation of projects and slump of stock prices.

Xu et al. (2014) found that the excess benefits provided by state-owned enterprises are positively correlated with the risk of a stock price crash. Senior managers of state-owned enterprises are motivated to conceal negative news for a longer period to enjoy extra benefits, leading to the increase of the stock price crash risk in the future. In companies where senior managers have at least two years to reach the age of retirement, the impact of excess benefits on the stock price crash risk is even more significant. Ben et al. (2018) pointed out that employee welfare practice is positively correlated with future stock price crash risk, which accords with principal–agent theory. In other words, the management will attempt to use generous employee welfare plans to reduce the possibility of employees' reporting of the management's misconduct, thereby helping the management control negative news. This phenomenon is especially evident in labor-intensive enterprises with poor management, ineffective investor protection, and low requirements for information disclosure.

Finally, from the perspective of stock characteristics, stock volatility, liquidity, and anchoring ratio have a prominent impact on the risk of a stock price crash. Chen et al. (2001) found that stock volatility had a predictive effect on stock price crash risk. Chang et al. (2017) adopted a decimal trading system as an exogenous impact of stock liquidity to explore the impact of stock liquidity on the risk of a stock price crash, and found that companies with stronger stock liquidity are more likely to release negative income news, making short-term investors sell off the stocks, and facilitating the management to conceal negative news. Consequently, the accumulated negative news would break forth in the late stage to cause a stock price crash. Yang et al. (2020) adopted anchoring ratio to describe the overestimation of stock prices and revealed a positive correlation with stock price crash risk. Less analyst tracking, more shareholding by retail investors, and higher stock liquidity strengthen the positive impact

of the anchoring ratio on the stock price crash risk.

The catalytic effect of multiple dimensions, including humanistic environment, market participants' behaviors, industrial environment, and institutional environment, on the risk of a stock price crash has been verified from the perspective of the external factors of enterprises. An et al. (2018) concluded that companies in countries with a higher degree of individualism face a higher stock price crash risk. Individualism spreads to overseas markets through foreign investors, thus affecting the local enterprises' stock price crash risk and intensifying the impact of enterprises' risk-taking and earnings management on the said risk. In addition, the positive correlation between individualism and stock price crash risk is amplified during global financial crises, whereas it is weakened by the improvement of financial information transparency at the national level and application of international financial reporting standards.

From the perspective of market participants' behaviors, some factors that exacerbate the stock price crash risk include the behaviors adopted by analysts and institutional investors. Xu et al. (2012) noted that analysts' "optimistic bias" positively impacts the risk of a stock price crash. Xu et al. (2013) later pointed out that the herd behavior of institutional investors presents a positive impact on companies' stock price crash risk, as evident in the herd behavior of "sellers," which the existence of QFII could not mitigate. Callen et al. (2015) found a positive correlation between investors' short selling and the risk of a stock price crash, indicating the ability of short sellers to identify the negative news controlled by the management. They further indicated that the predictive effect of short selling is more prominent in companies with weak governance mechanisms, excessive risk-taking, and a high degree of information asymmetry between the management and the shareholders.

Meanwhile, Li et al. (2019) observed that competition pressure from the product market intensifies the management's motive to conceal negative news, leading to an unexpected and drastic decline of stock prices in the late stage and an increase risk of a stock price crash. Ye et al. (2018) indicated that the constituent stock of Shanghai and Shenzhen 300 index will significantly increase the companies' stock price crash risk owing to pressure possibly brought by the name and liability of constituent stock to the management. Thus, the management would try its best to conceal negative measures for the sake of their performance, subsequently increasing the probability of a stock price crash.

Finally, from the perspective of institutional environment, scholars have noticed that some policies and regulations accelerate the stock price crash. For example, Chu et al. (2016) found that the margin trading system implemented since 2010 would exacerbate the risk of a stock price crash. You et al. (2022) stated that the policies implemented by local governments affect companies' stock price crash risk. Specifically, the more progressive the policies, the higher the stock price crash risk of local enterprises. This kind of connection is closely related to the government's motives to intervene and enterprises' motives to accede. The intrinsic mechanism test indicates that the administration style of the local government will act on the enterprises' stock price crash risk by impacting the legal construction, information transparency, and corporate information disclosure behavior in the region.

3 Research Hypotheses

In accordance with the analysis of Section 2, the primary reason contributing to plummeting stock prices lies in the management's cover-up of negative news, which can never last. When the accumulated negative news exceeds a threshold, an extreme outcome is in the form of plummeting stock prices (Hutton et al., 2009; Jiang, 2015; Chen et al., 2017). The management's motive to cover up negative news can be explained by principal–agent theory. The separation between managerial rights and company ownership enables the management to avoid sharing adverse information to the investors to pursue its own interests. Managers may conceal negative news out of their concern for their careers and to build false confidence in investors. If the performance of the company is highly undesirable, the management will face the reputation loss and even dismissal. Therefore, dressing up performance in financial statements is a common occurrence. Another motive is to acquire higher remuneration. If the management's remuneration is linked with the company's stock price, managers may choose to hide negative news to increase or prevent the decline of the stock price; they may then reduce their shareholding before the problem breaks out to cash out at a high stock price level. Therefore, managers may adopt strategies such as limited disclosure, delayed disclosure, and even non-disclosure to blind the investors of negative information, thus worsening the problem of information asymmetry between the company and the market.

As an important market participant and an information transmitter, institutional investors are controversial in the existing research with respect to their role in external corporate governance. Therefore, the impact of institutional investors on the stock price crash risk may also appear two-sided. On the one hand, institutional investors supplement and assist corporate governance. They are able to impose a vital impact on corporate decision-making and operation by means of active utterance and exit threat (Carleton et al., 1998; McCahery, 2016; Jiang et al., 2018). Scholars have also found that institutional investors can supervise and restrict the management of companies to a certain extent and benefit the reduction of the principal–agent problem between shareholders and the management. Therefore, institutional investors may supervise the senior managers of a company and participate in corporate governance by playing the role of "supervisor" with the objective to make the management reduce "hoarding behavior," improve information transparency, and lower the risk of a stock price crash. With a higher ratio of equity held, institutional investors may grow more motivated to implement supervision.

On the other hand, institutional investors cannot have an active effect on external corporate governance. As onlookers, institutional investors may even bring a negative impact on corporate governance. According to research on the different types of institutional investors, index funds and mutual funds seldom actively participate in the supervision, inquiries, and other relevant activities of their holding companies compared with hedge funds. The reason is that the income sources of these institutional investors come from managerial fees rather than price earnings from invested companies. Moreover, these institutional investors have a weaker discourse power compared with the management, and they intend to remain silent and play the role of onlooker regarding disagreements on important issues (Schmidt et al., 2017; Heath et al., 2022). Another negative impact arises in principal–agent problems that may exist between institutional investor managers and the actual investors, which will further exacerbate the severity of information asymmetry (Bebchuk, 2017). The reason is that the interests of investment managers are not same as those of their clients, the actual investors. Typically, investment managers still acquire large remunerations even when losses occur to the funds they manage. Meanwhile, institutional investors may engage in short-term speculation in a company, affecting the company's long-term development (Borochin et al., 2017). Institutional investors normally pursue high incomes and may focus on short-term financial performance rather than

corporate social responsibility, environmental impact, and other relevant aspects. Notably, institutional investors are essentially enterprises that pursue their own interests. Therefore, they may have be motivated to conspire with the management or substantial shareholders to benefit their interests regardless of the interests of other medium and small investors (Fu et al., 2008; Pan et al., 2011). In summary, the increase in shareholding ratio of institutional investors may lead them to conspire with the management and exacerbate the concealment of negative news, thus increasing the risk of a stock price crash. Based on the discussion above, we hypothesized as follows:

Hypothesis 1*: The higher the shareholding ratio of institutional investors, the higher the risk of a stock price crash.*

The stability of shareholding of these investors is also an important factor to consider. Notably, the impact of such stability on the risk of a stock price crash remains unclear. On the one hand, based on available evidence regarding the "supervisor" role played by institutional investors, the stability of shareholding of institutional investors may lower the stock price crash risk. Stable institutional investors have a good understanding of the holding companies and are able to maximize insider information on these companies and impose restrictions on the management, thereby participating in corporate governance in an effective manner (Chen et al., 2007). Koh (2007) found that institutional investors holding shares in companies for a long duration can reduce the companies' earnings management behaviors. Elyasiani et al. (2010) reported that stable institutional investors are motivated and have effective supervision ability, making them capable of playing an important role in the mitigation of principal–agent conflicts and reduction of the risk of opacity of corporate information. On the contrary, institutional investors who hold shares for a short period, or institutional investors with undesirable performance, may not be strongly motivated to participate in corporate governance because they tend to pursue short-term income, which will have an adverse influence on the company's long-term development. Bushee (1998) pointed out that enterprises are more likely to reduce long-term R&D projects to realize the goal of short-term profitability upon the frequent change of institutional investors.

On the other hand, owing to long-term shareholding, institutional investors may establish

a “firm” relationship with managers and access insider information, making them motivated to rake higher profits through insider transactions or conspire with the management (Cai et al., 2010). Indeed, institutional investors’ participation in insider transactions have been reported (Fu et al., 2008; Pan et al., 2011). Such research evidence indicates that the stability of institutional investors may further urge their collusion with the management, resulting in the exacerbation of the risk of a stock price crash. Thus, we hypothesized as follows:

Hypothesis 2*: The higher the stability of institutional investors, the higher the risk of a stock price crash.*

The characteristics of institutional investors also merit exploration. Research has noted the characteristic of herd behavior among institutional investors, which can affect the risk of a stock price crash. The herd behavior adopted by institutional investors may have a dual effect, depending on the motive of the herd behavior. On the one hand, the motive of the herd behavior of institutional investors may result from the management blindly following public information. Managers may choose to ignore private information and intend to process and analyze information known by the public (Deng et al., 2018). The herd behavior resulting from such kind of motive is called “genuine herding,” the consequences of which include the failure to completely reflect the private information owned by the management in the stock price. The subsequent information mismatch can further exacerbate the information opacity in the market and increase the possibility of a stock price crash (Xu et al., 2013).

On the other hand, the herd behavior of institutional investors may be informed by a comprehensive and reasonable analysis of the public and private information they have. This kind of herd behavior is called “pseudo herding” (Bikhchandani & Sharma, 2001; Xu et al., 2013). Pseudo herding can comprehensively reflect information in the stock prices, and the management does not conceal the private information. Thus, instead of being exacerbated, the stock price crash risk may even be reduced owing to the effective release of information. Thus, we hypothesized as follows:

Hypothesis 3*: The herd behavior of institutional investors will not exacerbate the risk of a stock price crash.*

Finally, the types of institutional investors have been distinguished, and whether the benchmark results would be affected has been observed. On the former, the effect of QFII has received much attention, given that most QFIIs include capital from Western developed countries. Notably, the viewpoints on the role played by these institutional investors have not been completely unified in the market.

According to scholars, QFIIs have no motive to participate in corporate governance because they have a relatively low shareholding ratio (Li et al., 2013; Shi et al., 2009). Thus, this type of institutional investors also lack any motive to actively negotiate with managers or play a more powerful supervisor role. Therefore, QFIIs would not actively supervise the management, meaning that their presence does not affect the management's motive to cover up negative news. As such, QFIIs, as profit-seeking entities, may choose to conspire with the management for short-term gains from high stock prices, which then intensifies the positive impact of the shareholding ratio of institutional investors on the risk of a stock price crash.

According to another viewpoint, the reason QFIIs have been introduced in the first place pertains to their maturity and professionalism in investment decision-making (Aggarwal et al., 2011). Moreover, given that QFII's capital comes from other countries, they appear more independent and less vulnerable to intimidation from the management and substantial shareholders that could make them conspire with the latter to cover up negative news. Therefore, the introduction of QFIIs can strengthen the mitigation effect of institutional investors' shareholding ratio on the stock price crash risk. Thus, we hypothesized as follows:

Hypothesis 4*: The introduction of QFIIs would intensify the positive impact of institutional investors' shareholding ratio on the risk of a stock price crash.*

4 Sample Selection and Data Sources

Our initial sample included all A-share listed companies in the Shanghai Stock Exchange and Shenzhen Stock Exchange of China. We set the time range of the data as starting from 2004, when the data disclosure of institutional investors began to become relatively complete, to 2022, when the data of the annual financial statements for 2022 had not been disclosed in the official database. To ensure data accuracy and reliability, we screened the

initial samples according to the following procedure: (1) We removed the data of listed companies in the financial industry that had been put under the state's strict regulation. (2) We removed the data of listed companies marked with ST and *ST; companies of this category suffered great losses, which could result in sample deviation. (3) We removed the data of listed companies that had missing data on the main variable. After screening, the total sample data contained 21,642 observations. To eliminate the impact of sample extremes on the empirical results, we winsorized all the variables per the quantiles of 1% and 99%. The data were acquired from the China Stock Market & Accounting Research database. After reasonable processing and screening, the data provided reliable support for our research.

4.1 Variable Definitions

1) Explained Variable

The explained variable was the risk of a stock price crash, measured by two indicators. First, negative skewness (*NCSKEW*) in price earnings can be used to capture the asymmetry of stock returns (Chen et al., 2021; Xu et al., 2013). If the skewness is negative, then the data lean to the right as a whole. The specific calculation method is as follows:

$$NCSKEW_{i,t} = -\frac{\left[n(n-1)^{\frac{3}{2}}\sum W_{i,t}^{3}\right]}{\left[(n-1)(n-2)\left(\sum W_{i,t}^{2}\right)^{\frac{3}{2}}\right]} \tag{1}$$

where $W_{i,t}$ represents the return of stock of company i in week t after market adjustment. It specifically refers to the residual in the market model, calculated as follows:

$$r_{i,t} = \alpha_i + \beta_1 r_{m,t-2} + \beta_2 r_{m,t-1} + \beta_3 r_{m,t} + \beta_4 r_{m,t+1} + \beta_5 r_{m,t+2} + \varepsilon_{i,t} \tag{2}$$

$$W_{i,t} = L\,n\left(1 + \varepsilon_{i,t}\right) \tag{3}$$

where $r_{i,t}$ represents the logarithm return of company i at the end of week t, and $r_{m,t}$ represents the market return at the end of week t.

The second indicator used to measure stock price crash risk is down-to-up volatility (*DUVOL*). We divided the stock return data into two subsamples, namely, up weeks and down weeks, according to whether the weekly return ($r_{i,t}$) of stock i after market adjustment

exceeded the annual average return. We then calculated the standard deviations of the stock return (R_u, R_d) in these two subsamples. The calculation method of *DUVOL* is as follows:

$$DUVOL_{i,t} = Ln\left\{\frac{[(n_u - 1)\sum_{down} R_d^2]}{n_d - 1\sum_{down} R_u^2}\right\} \quad (4)$$

where n_u and n_u represent the number of weeks in which the weekly return of company i exceeds the annual average return.

2) Explanatory Variables

Our first explanatory variable was the shareholding ratio of institutional investors, which could measure external corporate governance (*INSH*). The specific calculation method is the ratio of shares held by institutional investors to the total share capital (Cheng, 2006; Yang et al., 2012). The second explanatory variable was the shareholding stability of institutional investors (*Instability*), calculated as the average of standard deviations of the shareholding ratio of institutional investors within two or three years (Liu et al., 2012). The third explanatory variable was the herd behavior of institutional investors (*HERD*), calculated as the absolute value obtained from the deduction of the standard deviation from the mean value of the adjustment item of *HERD* (Xu et al., 2013).

3) Control Variables

We selected the following control variables, with reference to prior research (Xu et al., 2013; Kim et al., 2014; Hu et al., 2020): (1) Annual average weekly return of the company stock (*RET*), or the annual average of the weekly return of the company stock; (2) Standard deviation of the annual weakly return of the company stock (*SIGMA*); (3) Monthly average excess turnover rate (*MDIFF*), or the annual average of the balance obtained from the deduction of the de-trended monthly turnover rate of the previous year from the de-trended monthly turnover rate of the stock in the current year; (4) Asset–liability ratio of the company (*LEV*), or the ratio between total liabilities and total assets of the company; (5) Book-to-market ratio of the company (BM), or the ratio between market and book value of the company; (6) Degree of the company's earnings management (ABSACC), or the absolute value of accrued earnings for the correction of the Jones model estimation; and (7) Information transparency of the company (OPAQUE), providing three-year moving averages of accrued earnings for the

correction of the Jones model estimation. We also added industry fixed effects (*INDUSTRY fixed effects*) and year fixed effects (*YEAR fixed effects*) to the regression model, to control for other influencing factors that may be omitted. The definitions of specific variable data are detailed in Table 1.

Table 1 Definitions and Explanations of Primary Variables

Category	Symbol of variable	Name of variable	Definition of variable
Explained variable	*NCSKEW*	Indicator 1 of stock price crash risk	Negative skewness
	DUVOL	Indicator 2 of stock price crash risk	Down-to-up volatility of the company's stock price
Explanatory variables	*INSH*	Shareholding ratio of institutional investors	Ratio of shares held by institutional investors to the total share capital
	Instability	Stability of institutional investors	Average of standard deviation of shareholding ratio of each institutional investor of company stock within a three-year period, including the current year and the past two years, for the measurement of the stability of institutional investors
	HERD	Herd behavior of institutional investors	Absolute value obtained from the deduction of the standard deviation from the mean value as adjustment item
Control variables	*RET*	Annual average weekly return of the company stock	Annual average of weekly return of the company stock
	SIGMA	Standard deviation of annual weekly return of the company stock	Annual standard deviation of the weekly return of the company stock
	MDIFF	Monthly average excess turnover rate	Annual average of the balance obtained from the deduction of the de-trended monthly turnover rate of the previous year from the de-trended monthly turnover rate of the stock in the current year
	SIZE	Company size	Natural logarithm of the total assets of the company
	ROA	Return on assets of the company	Ratio between the net profits and total assets of the company
	LEV	Asset–liability ratio of the company	Ratio between the total liabilities and total assets of the company
	BM	Book–market ratio of the company	Ratio between the market and book value of the company
	ABSACC	Degree of earnings management of the company	Absolute value of accrued earnings for the correction of Jones model estimation
	OPAQUE	Information transparency of the company	Three-year moving average of accrued earnings for the correction of Jones model estimation

4.2 Model Design

To verify the hypothesis, we constructed the following benchmark regression model, with reference to prior research (Cheng, 2006; Yang et al., 2012; Chen et al., 2021):

$$Crash\_risk_{i,t} = \alpha_i + \beta_1 INSH_{i,t-1} + \beta_2 Control_{i,t-1} + Fixed\ Effects + \varepsilon_{it} \quad (5)$$

where explained variable $Crash\_risk_{i,t}$ represents the degree of the stock price crash risk of company i in year t. It is measured by the two indicators $NCSKEW_{i,t}$ and $DUVOL_{i,t}$. To reduce the disturbance of endogenous problems, we lagged the explanatory and control variables for one period. The core explanatory variable is $INSH_{i,t-1}$. $Control_{i,t-1}$ represents all control variables (Table 1). *Fixed Effects* represents industry and year fixed effects.

Table 2 shows the descriptive statistical analysis indicators of our primary variables, whereas Table 3 shows the correlation test coefficients between our primary variables.

Table 2 Descriptive Statistics

Name of variable	Obs	Mean	SD	Min	Median	Max
NCSKEW	21,642	-0.266	1.294	-3.714	-0.248	2.779
DUVOL	21,642	-0.148	0.963	-2.502	-0.168	2.271
RET	21,642	0.003	0.011	-0.019	0.002	0.036
SIGMA	21,642	0.063	0.023	0.026	0.058	0.139
MDIFF	21,642	-57.041	385.977	-1484.38	-17.764	896.547
HERD	21,642	19.710	10.076	5.227	17.792	47.321
INSH	21,642	48.953	24.505	0.405	52.469	91.780
Instability	6,067	0.256	0.502	0.000	0.084	3.313
SIZE	21,642	8.380	1.355	5.440	8.221	12.511
ROA	21,642	0.033	0.069	-0.352	0.033	0.204
LEV	21,642	0.477	0.209	0.070	0.478	1.085
BM	21,642	0.629	0.240	0.113	0.634	1.138
ABSACC	21,642	0.059	0.059	0.000	0.040	0.284
OPAQUE	14,760	0.003	0.056	-0.273	0.001	0.282
QFII	21,642	0.108	0.310	0.000	0.000	1.000

Note: Observation of variable (Obs), mean value (Mean), standard deviation (SD), minimum (Min), median (Median), and maximum (Max).

We found that NCSKEW and DUVOL were highly positively correlated. In other words, both of them can be used to reasonably measure the risk of a stock price crash. This finding is of great significance for investors and analysts who are interested in the potential crash risk of stock investments. As for the shareholding ratio of institutional investors (*INSH*), we observed a positive correlation with the correlation coefficients of the aforesaid two stock price crash risk indicators. The results indicated that the bigger the shareholding ratio of institutional investors, the more significantly positive the impact will be on the stock price crash risk. We

also found that the correlation coefficients between all control variables were not abnormally high. Apart from indicating the absence of any multicollinearity problem in the samples, these values suggested that the data could be used to conduct regression analysis, to acquire accurate and reliable results.

However, the causal relations of the different variables could not be established, or the effect provided could not be quantified. The correlation coefficients in Table 3 can only provide information regarding intensity and direction of relations between different variables. Therefore, we conducted further analysis to elucidate the relations between different variables, as well as the possible impact of these variables on the dependent variables. In summary, Table 3 provides a useful starting point for the exploration of the relations between the variables and the pursuit of possible explanatory factors.

Table 3 Correlation Test

	$NSCKEW_t$	$DUVOL_t$	RET_{t-1}	$SIGMA_{t-1}$	$MDIFF_{t-1}$	$HERD_{t-1}$	$INSH_{t-1}$	$Instability_{t-1}$	$SIZE_{t-1}$	ROA_{t-1}	LEV_{t-1}	BM_{t-1}	$ABSACC_{t-1}$	$OPAQUE_{t-1}$
$NSCKEW_t$	1													
$DUVOL_t$	0.932***	1												
RET_{t-1}	0.043**	0.020	1											
$SIGMA_{t-1}$	0.025	0.027	0.463***	1										
$MDIFF_{t-1}$	-0.024	-0.045**	0.403***	0.383***	1									
$HERD_{t-1}$	-0.036*	-0.017	-0.006	-0.023	-0.081***	1								
$INSH_{t-1}$	0.065***	0.054***	0.011	-0.195***	0.009	0.118***	1							
$Instability_{t-1}$	0.017	0.001	0.050***	0.092***	0.061***	-0.033*	0.004	1						
$SIZE_{t-1}$	0.027	0.024	-0.014	-0.217***	0.048**	0.123***	0.514***	-0.198***	1					
ROA_{t-1}	0.063***	0.066***	0.174***	-0.122***	-0.009	0.090***	0.130***	-0.091***	0.069***	1				
LEV_{t-1}	0.001	-0.013	-0.052***	0.034*	0.034*	-0.086***	0.087***	-0.005	0.370***	-0.429***	1			
BM_{t-1}	-0.072***	-0.076***	-0.084***	-0.243***	0.038**	-0.046**	0.221***	-0.057***	0.634***	-0.199***	0.370***	1		
$ABSACC_{t-1}$	0.035*	0.033*	0.015	0.129***	-0.021	-0.036*	-0.099***	0.091***	-0.142***	-0.214***	0.101***	-0.133***	1	
$OPAQUE_{t-1}$	0.037*	0.040**	0.053***	-0.044**	0.026	0.029	0.021	-0.073***	0.052***	0.307***	-0.225***	-0.050***	-0.033*	1

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

5 Multiple Regression Analysis

We formulated a regression model to verify Hypothesis 1. The results in Table 4 present the impact of the shareholding ratio of institutional investors on the risk of a stock price crash. Specifically, the regression coefficients in Columns (1) and (2) of the explained variable (*NSCKEW*) and core explanatory variable (*INSH*) are significantly positive. The results in Column (1) present the separate impact of the shareholding ratio of institutional investors on the risk of a stock price crash, whereas the results in Column (2) are obtained after other

characteristic variables of companies are controlled. The coefficients of the two columns fully demonstrated that the bigger the shareholding ratio of institutional investors, the higher the stock price crash risk. The regression coefficient in Column (2) explains the economic significance—the stock price crash risk rises by 0.8% for every 1% increase in shareholding ratio of institutional investors.

To ensure the robustness of the results, we adopted another indicator to measure the stock price crash risk (*DUVOL*). Columns (3) and (4) show the regression results when this indicator is used as the explained variable. The regression coefficient of the core explanatory variable (*INSH*) remained positive and was significant at the 1% level regardless of the addition of control variables.

In summary, the results in Table 4 explained the positive impact of the shareholding ratio of institutional investors onstock price crash risk—the higher the shareholding ratio of institutional investors, the higher the stock price crash risk of the company. This positive relation does not accord with previous findings. An et al. (2013) found that with a bigger shareholding ratio of institutional investors in the US, both the synchronism of stock prices and the stock price crash risk would be reduced. Moreover, they concluded that institutional investors are strongly motivated to supervise because of their control over stock rights. However, our analysis presented an opposite result, which may be explained when institutional investors are viewed as essentially profit-seeking microcosmic individuals. They may gain more discourse power at the level of shareholders if they have a higher equity ratio. Subsequently, it will be convenient for them to negotiate and communicate with the management. Rather than supervising the managers to achieve better corporate governance, institutional investors may desire to conspire with the managers for higher gains, during which the interests of small and medium-sized investors may be harmed. Thus, institutional investors in the Chinese stock market do not play a supervisory role but rather facilitate the management's concealment of negative news, in turn increasing the stock price crash risk. Therefore, the results supported Hypothesis 1.

Table 4 Shareholding Ratio of Institutional Investors and Stock Price Crash Risk

	(1) *NSCKEW*	(2) *NSCKEW*	(3) *DUVOL*	(4) *DUVOL*
$INSH_{t-1}$	0.008***	0.008***	0.006***	0.006***

	(4.404)	(3.612)	(4.415)	(3.523)
$NSCKEW_{t-1}$	-0.103***	-0.111***		
	(-3.503)	(-3.420)		
$DUVOL_{t-1}$			-0.106***	-0.118***
			(-3.486)	(-3.317)
RET_{t-1}		3.112		0.483
		(0.501)		(0.091)
$SIGMA_{t-1}$		-0.959		-0.412
		(-0.310)		(-0.164)
$MDIFF_{t-1}$		-0.000**		-0.000*
		(-2.226)		(-2.024)
ROA_{t-1}		0.592		0.401
		(1.559)		(1.292)
$SIZE_{t-1}$		-0.028		-0.000
		(-0.381)		(-0.007)
BM_{t-1}		-0.584*		-0.447
		(-1.843)		(-1.648)
LEV_{t-1}		0.063		-0.002
		(0.421)		(-0.019)
$ABSACC_{t-1}$		0.403*		0.259
		(1.872)		(1.492)
cons	-0.719***	-0.169	-0.504***	-0.239
	(-5.742)	(-0.368)	(-5.309)	(-0.636)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	21,530	21,530	21,527	21,527
Adj-R^2	0.009	0.024	-0.001	0.016

Note: Value t calculated per corporate cluster. Numbers in brackets indicate robust standard error. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Next, we added an indicator of stability of institutional investors (*Instability*) to the benchmark model. We used *Instability*, as a control variable, to profoundly study whether the characteristics of institutional investors would affect the relation between institutional investors and stock price crash risk. The specific model is as follows:

$$Crash\_risk_{i,t} = \alpha_i + \beta_1 INSH_{i,t-1} + \beta_2 Instability_{i,t-1} + \beta_2 Control_{i,t-1} + Fixed\ Effects + \varepsilon_{it} \quad (5)$$

Table 5 presents the regression results. We adopted the standard deviation of the shareholding ratio of institutional investors as the stability indicator of institutional investors. Therefore, the bigger this value, the more unstable the institutional investors would become.

The results in Columns (1) and (2) show that the shareholding ratio of institutional investors has a significantly positive impact on the stock price crash risk (*NSCKEW*) even after controlling for the stability of institutional investors. In addition, this positive relation remained valid even after we measured the stock price crash risk using another method. The results in Columns (3) and (4) give the regression coefficient between shareholding ratio of institutional investors and stock price crash risk (*DUVOL*) after the stability of institutional investors has been controlled. Their t statistics indicated a significant impact. Meanwhile, in Columns (2) and (4), the stability of institutional investors shows a negative impact on the stock price crash risk, indicating that the risk is greater if the institutional investors are more unstable. However, this impact was very weak, and only significant at the 10% level. In summary, the empirical results in Table 5 indicate that the stability of institutional investors has a positive impact on the stock price crash risk after the former has been introduced to the model of shareholding ratio of institutional investors. Thus, the management is more inclined to conceal negative news when the institutional investors of the company are more stable, thereby increasing the risk of a stock price crash. These results supported the role of "conspirator" played by institutional investors, and accorded with Hypothesis 2.

Meanwhile, our finding regarding the relation between institutional investor stability (*Instability*) and stock price crash risk contradicted the conclusion drawn by Callen et al. (2013): The higher the stability of institutional investors, the lower the stock price crash risk in the next year. Their conclusion supports the role of "supervisor" played by institutional investors who are not defined as short-term profit-seekers. However, their finding may only apply to listed companies in the US. Our research, conducted based on Chinese listed companies, yielded a completely opposite conclusion. The supervisory role of institutional investors has not been effectively adopted in the Chinese stock market. Instead, Chinese institutional investors conspire with managers. Therefore, the government should not only strengthen the regulation of listed companies but also effectively supervise institutional investors, to lower their motive to harm the interests of small and medium-sized investors.

Table 5 Shareholding Ratio of Institutional Investors, Stability of Institutional Investors, and Stock Price Crash Risk

	(1) $NSCKEW_t$	(2) $NSCKEW_t$	(3) $DUVOL_t$	(4) $DUVOL_t$

$INSH_{t-1}$	0.017***	0.018***	0.014***	0.014***
	(5.891)	(6.140)	(6.391)	(6.481)
$Instability_{t-1}$	-0.103	-0.106*	-0.073	-0.074*
	(-1.632)	(-1.712)	(-1.642)	(-1.690)
$NSCKEW_{t-1}$	-0.179***	-0.190***		
	(-12.185)	(-11.340)		
$DUVOL_{t-1}$			-0.177***	-0.199***
			(-12.426)	(-11.983)
RET_{t-1}		-3.996		-6.249***
		(-1.288)		(-2.795)
$SIGMA_{t-1}$		4.164***		4.117***
		(3.294)		(4.548)
$MDIFF_{t-1}$		-0.000***		-0.000***
		(-6.506)		(-8.008)
ROA_{t-1}		1.314***		0.954***
		(3.222)		(3.160)
$SIZE_{t-1}$		-0.114***		-0.083***
		(-3.251)		(-3.186)
BM_{t-1}		-0.385**		-0.255**
		(-2.513)		(-2.203)
LEV_{t-1}		0.250		0.111
		(1.061)		(0.626)
$ABSACC_{t-1}$		0.737*		0.414
		(1.835)		(1.371)
_cons	-1.216***	-0.441	-0.902***	-0.373
	(-7.737)	(-1.186)	(-7.689)	(-1.378)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,889	5,889	5,888	5,888
Adj-R^2	0.048	0.068	0.048	0.075

Note: Value t calculated per corporate cluster. Robust standard errors are shown in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Nonetheless, the functions provided and role played by institutional investors may change with the continual improvement of China's capital market. The available research on the characteristics of institutional investors and stock price crash risk has used data prior to the year 2013 (Xu et al., 2013; An et al., 2013; Callen et al., 2013). However, institutional investors in China's capital market may have been underdeveloped during this period. Therefore, the time dimension should be considered in a staged re-survey of the relation between the characteristics of institutional investors and stock price crash risk.

The results in Table 6 present the relation of shareholding ratio and institutional investor stability with stock price crash risk before and after 2014. Specifically, Columns (1) and (2) show the regression analysis results through the use of *NSCKEW* as an indicator of stock price crash risk. We noted that the impact of the shareholding ratio of institutional investors on the stock price crash risk was positive before and after 2014, and that institutional investors had never played a supervisory role well in the capital market.

We also noted a difference in the regression coefficients of the stability of institutional investors. Among the samples before 2014, as shown in Column (1), the stability of institutional investors did not have a significant impact on the stock price crash risk; however, among the samples after 2014, as shown in Column (2), the same had a significant impact on the stock price crash risk. This difference in impact before and after 2014 proved the change in the role played by institutional investors in the development of the capital market. This difference remained even when we used *DUVOL* to measure the stock price crash risk. Columns (3) and (4) show the consistent positive impact of shareholding of institutional investors on the stock price crash risk before and after 2014. The difference in the impact was very prominent.

On the whole, through the piecewise regression analysis of samples per time dimension (i.e., 2004–2014 and 2014–2021), we found that the shareholding ratio of institutional investors always positively impacted the risk of a stock price crash, whereas the impact of the stability of institutional investors was more significant after 2014. Thus, the role of institutional investors as "cooperators" has been highlighted with the development of China's capital market.

Table 6: Shareholding Ratio of Institutional Investors, Stability of Institutional Investors, and Stock Price Crash Risk: Piecewise Analysis before and after 2014

	(1) Before 2014 $NSCKEW_t$	(2) After 2014 $NSCKEW_t$	(3) Before 2014 $DUVOL_t$	(4) After 2014 $DUVOL_t$
$INSH_{t-1}$	0.022***	0.009**	0.016***	0.008**
	(2.724)	(2.008)	(2.635)	(2.401)
$Instability_{t-1}$	-0.076	-0.167**	0.018	-0.153***
	(-0.571)	(-2.221)	(0.186)	(-2.858)
$NSCKEW_{t-1}$	-0.363***	-0.247***		
	(-8.652)	(-13.907)		
$DUVOL_{t-1}$			-0.365***	-0.265***
			(-8.600)	(-14.988)
RET_{t-1}	4.862	-0.905	0.554	-3.914

	(0.561)	(-0.261)	(0.083)	(-1.600)
$SIGMA_{t-1}$	0.717	1.916	3.192	2.077**
	(0.181)	(1.353)	(1.145)	(2.041)
$MDIFF_{t-1}$	0.001***	-0.000***	0.000***	-0.000***
	(3.382)	(-7.272)	(2.608)	(-8.557)
ROA_{t-1}	1.830**	0.554	1.518***	0.214
	(2.497)	(1.115)	(2.758)	(0.607)
$SIZE_{t-1}$	-0.198	0.067	-0.164*	0.085
	(-1.516)	(0.721)	(-1.719)	(1.269)
BM_{t-1}	0.557	-1.744***	0.637**	-1.373***
	(1.527)	(-8.924)	(2.276)	(-9.461)
LEV_{t-1}	0.355	-0.375	0.396	-0.428
	(0.559)	(-0.909)	(0.816)	(-1.498)
$ABSACC_{t-1}$	0.259	1.065**	-0.297	0.788**
	(0.334)	(2.156)	(-0.492)	(2.166)
_cons	-0.482	-0.383	-0.505	-0.512
	(-0.399)	(-0.496)	(-0.564)	(-0.923)
Firm FE	Yes	No	No	No
Year FE	Yes	Yes	Yes	Yes
N	1,530	4,213	1,530	4,213
Adj-R^2	0.156	0.110	0.182	0.114

Note: Value t calculated per corporate cluster. Robust standard errors are shown in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Another characteristic of institutional investors we explored was the impact of their herd behavior (*HERD*) on stock price crash risk. We added the *HERD* indicator to the benchmark model as a new control variable. The specific model is as follows:

$$Crash\_risk_{i,t} = \alpha_i + \beta_1 INSH_{i,t-1} + \beta_2 Herd_{i,t-1} + \beta_3 Control_{i,t-1} + Fixed\ Effects + \varepsilon_{it} \quad (5)$$

We used the absolute value obtained from the deduction of the standard deviation from the mean value as the adjustment item of *HERD*. The regression results in Table 7 indicate that the shareholding ratio of institutional investors still has a significantly positive impact on the stock price crash risk (with either *NSCKEW* or *DUVOL* as measurement indicator) even after the characteristic of herd behavior is added. The regression coefficients indicated that the herd behavior of institutional investors would not cause a significant deviation in the impact on the main outcome. In addition, only the results of Column (3) indicate that the herd behavior of institutional investors has a slightly positive impact on stock price crash risk.

The herd behavior of institutional investors did not have an intensifying or mitigating

effect on the stock price crash risk during the period from 2004 to 2021. This finding counters that of Xu et al. (2013), in which the data of listed companies from 2005 to 2010 showed that the herd behavior of institutional investors increases the possibility of a stock price crash. Xu et al. (2013) posited that institutional investors choose to follow the public blindly and ignore their own private information. Consequently, some information is not reflected in the stock prices, further exacerbating the stock price crash risk. After considering data from 2013 to 2021, we observed the herd behavior of institutional investors did not have a significant impact on the stock price crash risk. Thus, institutional investors tended to make investment decisions based on the information they obtain rather than by following the public blindly. These findings lent support to Hypothesis 3.

Table 7: Shareholding Ratio of Institutional Investors, Herd Behavior of Institutional Investors, and Stock Price Crash Risk

	(1) $NSCKEW_t$	(2) $NSCKEW_t$	(3) $DUVOL_t$	(4) $DUVOL_t$
$INSH_{t-1}$	0.008***	0.005***	0.006***	0.004***
	(7.589)	(3.443)	(8.028)	(3.550)
$HERD_{t-1}$	0.001	0.000	0.002*	0.001
	(0.609)	(0.185)	(1.659)	(0.797)
$NSCKEW_{t-1}$	-0.103***	-0.123***		
	(-14.550)	(-13.203)		
$DUVOL_{t-1}$			-0.106***	-0.127***
			(-15.260)	(-13.709)
RET_{t-1}		7.418***		4.255***
		(5.647)		(4.230)
$SIGMA_{t-1}$		-0.546		-0.088
		(-0.856)		(-0.187)
$MDIFF_{t-1}$		-0.000***		-0.000***
		(-7.887)		(-8.924)
ROA_{t-1}		0.269		0.112
		(1.051)		(0.594)
$SIZE_{t-1}$		0.051**		0.067***
		(2.311)		(3.957)
BM_{t-1}		-1.087***		-0.853***
		(-13.402)		(-13.920)
LEV_{t-1}		0.208*		0.089
		(1.682)		(0.965)
$OPAQUE_{t-1}$		0.748***		0.502**

		(2.614)		(2.367)
_cons	-0.737***	-0.504**	-0.539***	-0.554***
	(-12.565)	(-2.499)	(-12.231)	(-3.614)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	21,530	14,387	21,527	14,387
Adj-R^2	0.009	0.038	-0.001	0.031

Note: Value t calculated per corporate cluster. Robust standard errors are shown in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

The aforementioned findings similarly highlighted the importance of the time dimension in analyses. As such, we again conducted piecewise analysis of the samples. We performed regression analysis for the samples in two stages, namely, 2004–2014 and 2014–2021. The results are presented in Table 8. As shown in the regression results in Columns (1) and (2), the impact of the shareholding ratio of institutional investors on the stock price crash risk (*NSCKEW*) was not significant before the year 2014 and after the herd behavior of institutional investors was controlled. During this period, the impact of the herd behavior of institutional investors on the stock price crash risk (*NSCKEW*) was positively significant. However, after the year 2014, the impact of the herd behavior of institutional investors on the stock price crash risk (*NSCKEW*) disappeared, replaced by the positive impact of the shareholding ratio of institutional investors.

This difference remained even after we used *DUVOL* to measure the stock price crash risk. According to the results in Columns (3) and (4), the impact of the shareholding ratio of institutional investors on the stock price crash risk was not significant before 2014 and after the herd behavior of institutional investors was controlled. The impact of the latter was positively significant. However, after the year 2014, the impact of investors' herd on the stock price crash risk also disappeared, and the positive impact of the shareholding ratio of institutional investors was highlighted.

The difference before and after 2014 proved that institutional investors were not mature in the initial development stage of China's capital market and they tended to choose to follow the public blindly and process known public information instead of paying attention to private information. As a consequence, information in the capital market was even more opaque, which

increased the possibility of a stock price crash. During this earlier period, the herd behavior of institutional investors had a significantly positive impact on the risk of a stock price crash, in line with the findings of Xu et al. (2013). However, as time passed, the positive impact of the herd behavior of institutional investors on stock price crash risk disappeared, as reflected in our results for data from 2014 to 2021. Thus, institutional investors with growing power may be more confident in the information they have as they navigate the developing and improving capital market. These institutional investors were no longer affected by public information. At this point, the impact of the shareholding ratio of institutional investors on the stock price crash risk gradually became a dominant factor.

Table 8: Shareholding Ratio of Institutional Investors, Herd Behavior of Institutional Investors, and Stock Price Crash Risk: Piecewise Analysis before and after 2014

	(1) Before 2014 $NSCKEW_t$	(2) After 2014 $NSCKEW_t$	(3) Before 2014 $DUVOL_t$	(4) After 2014 $DUVOL_t$
$INSH_{t-1}$	-0.004	0.005*	-0.003	0.004**
	(-1.585)	(1.672)	(-1.541)	(2.048)
$HERD_{t-1}$	0.005*	0.003	0.005*	0.004
	(1.656)	(0.715)	(1.902)	(1.417)
$NSCKEW_{t-1}$	-0.146***	-0.190***		
	(-8.918)	(-14.867)		
$DUVOL_{t-1}$			-0.162***	-0.202***
			(-9.888)	(-15.823)
RET_{t-1}	10.953***	10.638***	8.108***	4.732**
	(3.330)	(3.585)	(3.166)	(2.167)
$SIGMA_{t-1}$	4.372**	1.788	3.731***	1.595*
	(2.539)	(1.349)	(2.893)	(1.665)
$MDIFF_{t-1}$	-0.000**	-0.000**	-0.000***	-0.000**
	(-2.310)	(-2.015)	(-2.678)	(-2.541)
ROA_{t-1}	-0.156	-0.136	-0.281	-0.067
	(-0.390)	(-0.361)	(-0.928)	(-0.254)
$SIZE_{t-1}$	0.338***	0.297***	0.287***	0.237***
	(5.244)	(4.251)	(5.839)	(4.740)
BM_{t-1}	-1.481***	-1.529***	-1.159***	-1.178***
	(-8.574)	(-10.082)	(-8.516)	(-10.520)
LEV_{t-1}	-0.220	-0.158	-0.255	-0.117
	(-0.947)	(-0.650)	(-1.457)	(-0.676)
$OPAQUE_{t-1}$	0.144	0.859*	0.214	0.528
	(0.294)	(1.845)	(0.600)	(1.570)
_cons	-2.263***	-2.520***	-1.896***	-2.008***

	(-5.021)	(-4.197)	(-5.485)	(-4.671)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	6,076	7,946	6,076	7,946
Adj-R^2	0.105	0.136	0.100	0.152

Note: Value t calculated per corporate cluster. Robust standard errors are shown in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

We also introduced QFII to assess its impact on the risk of a stock price crash. In the empirical operation, we divided all samples into two groups, with one group containing the QFIIs samples and the other group containing none. Columns (1) and (2) in Table 9 present the regression results of the shareholding ratio of institutional investors against *NSCKEW* in the two groups of samples. The results indicated that the positive impact of the shareholding ratio of institutional investors was more significant in sample companies share-held by QFIIs. This difference remained even after the indicator *DUVOL* was used to measure the risk of a stock price crash, as shown in Columns (3) and (4) of Table 9. The results enhanced the robustness of the aforesaid findings.

In sum, the shareholding ratio of institutional investors had a greater impact in companies share-held by QFIIs compared with those without shareholding by QFIIs. In listed companies share-held by QFIIs, the bigger the shareholding ratio of institutional investors, the greater the stock price crash risk. Moreover, QFIIs could not consolidate the supervision of corporate governance, and, instead of effectively stabilizing the market, they tended to boost the stock price crash. Therefore, our results supported Hypothesis 4.

Table 9: Shareholding Ratio of Institutional Investors and Stock Price Crash Risk: Considering the Impact of QFIIs

	(1) QFII $NSCKEW_t$	(2) Non-QFII $NSCKEW_t$	(3) QFII $DUVOL_t$	(4) Non-QFII $DUVOL_t$
$INSH_{t-1}$	0.011*	0.008***	0.009*	0.006***
	(1.766)	(3.345)	(1.963)	(3.425)
$NSCKEW_{t-1}$	-0.114***	-0.118***		
	(-2.996)	(-3.530)		
$DUVOL_{t-1}$			-0.140***	-0.124***
			(-3.644)	(-3.423)
RET_{t-1}	-4.574	3.940	-5.776	0.990
	(-0.719)	(0.632)	(-1.172)	(0.184)
$SIGMA_{t-1}$	1.912	-1.245	1.612	-0.564
	(0.699)	(-0.398)	(0.747)	(-0.220)
$MDIFF_{t-1}$	-0.000	-0.000**	-0.000**	-0.000*

	(-1.599)	(-2.272)	(-2.135)	(-2.002)
ROA_{t-1}	0.884	0.638	0.612	0.438
	(0.857)	(1.623)	(0.783)	(1.379)
$SIZE_{t-1}$	-0.024	-0.034	0.018	-0.006
	(-0.296)	(-0.468)	(0.276)	(-0.104)
BM_{t-1}	-0.467	-0.584*	-0.243	-0.448
	(-1.450)	(-1.798)	(-0.896)	(-1.625)
LEV_{t-1}	-0.244	0.070	-0.346	0.011
	(-0.473)	(0.471)	(-0.860)	(0.091)
$ABSACC_{t-1}$	-0.228	0.435*	0.317	0.264
	(-0.309)	(1.771)	(0.594)	(1.350)
_cons	-0.480	-0.081	-0.708	-0.168
	(-0.563)	(-0.186)	(-1.094)	(-0.468)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	1,819	19,164	1,818	19,162
Adj-R^2	0.033	0.026	0.031	0.018

Note: Value t calculated per corporate cluster. Robust standard errors are shown in brackets. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

6 Conclusion

We investigated the impact of the characteristics of institutional investors on the stock risk of a price crash by examining companies listed in China's A-share market from 2004 to 2021. The main findings are as follows. First, we found that the increase in the proportion of institutional investors in the shareholders of listed companies significantly increased the risk of a stock price crash. The results remained robust even after the replacement of explanatory variables. This finding challenges the role of institutional investors as "supervisors" and affirms their role as "accomplices" in the existing studies. Moreover, this finding elucidates the role of institutional investors in the stock market, offering insights for investors and government regulators alike.

Second, we found that when institutional investors were more stable, companies were more inclined to hide negative news, which then increased the risk of a stock price crash. This finding lends support to the idea that institutional investors play the role of "co-conspirators." After we empirically analyzed the samples divided into time periods, we found that the influence of institutional investors' stability on stock price crash risk was more significant after 2014. This indicated that in the continuous development of China's capital market, the situation of institutional investors participating in "collusion" was also increasing. This finding sounds

the alarm for the increasingly "institutional" structure of investors in the current market. Preventing collusion between institutional investors and enterprises represents a new problem that needs to be considered in the design and implementation of future regulatory systems.

Third, our study also revealed that the herd behavior of institutional investors had no significant effect on the stock price crash risk of the entire sample. However, the herding behavior of early institutional investors played a leading role in the influence of institutional investors on corporate behavior. With the gradual development of China's capital market, the shareholding ratio of institutional investors plays an increasingly dominant role in the influence of institutional investors on corporate behavior.

Finally, we confirmed that among the listed companies held by QFII, shares held by institutional investors exacerbated the crash risk of stock prices. As such, foreign institutional investors may not be an effective external corporate governance mechanism. They do not play a role in stabilizing the market but rather boost the risk of a stock price crash.

We expected our study to contribute, first, to the exploration of the effect of external corporate governance of institutional investors on listed companies. The existing evidence regarding the effect of external corporate governance of institutional investors has supported their supervisory role. In other words, institutional investors' participation in the capital market is reported as an effective external corporate governance mechanism (Kim et al., 2011; Kang et al., 2018; Cornett et al., 2008; Dyck et al., 2019). However, the data adopted in such research are mostly obtained from Western developed countries where the capital markets are mature, and the development history of institutional investors has far exceeded China's progress. Therefore, institutional investors may play a different role in China's capital market. Our research, focusing on the risk of a stock price crash, indicated that the increase in the shareholding ratio of institutional investors would result in a higher crash risk, and the stability of their shareholding would worsen this situation. This finding challenges the view of institutional investors as "supervisors." Our study provided new evidence on the impact of institutional investors on the capital market.

Second, our work will enrich the research on the stock price crash risk of listed companies. The existing research regarding the triggers of the risk of a stock price crash and the corresponding preventive measures has focused on the catalytic effect of internal corporate

factors (Jiang et al., 2015; Quan et al., 2016; Chen et al., 2017; Zhang et al., 2017; Sun et al., 2017; Yi et al., 2019; Kim et al., 2016) and the preventive mechanism of internal corporate governance (Wang et al., 2015; Liang et al., 2016; Ye et al., 2015; Kim et al., 2014; Song et al., 2017). However, research on how the external corporate governance mechanism prevents stock price crashes is relatively limited. In particular, analysis and research regarding the characteristics of institutional investors lack depth. Our study supplied relevant evidence that can help thoroughly elucidate the capital market and stock price crash risk.

In summary, our research investigated the effect of the external corporate governance of institutional investors among important participants of China's capital market. Our findings shed light on the hidden dangers possibly brought by the phenomenon of gradual "institutionalization" of the style of investment subjects in the current stock market. The topic of our study is innovative to a certain extent, and we have presented relevant research conclusions that beneficially supplement the current understanding of the relation between institutional investors and stock price crash risk. We have also provided new empirical evidence for the role played by institutional investors in external corporate governance. At the same time, our research findings provide novel insights for the prevention of stock price crashes and strengthening of investor protection.

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