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# Do Abnormal Audit Report Lags Signal Impending Stock Price Crash?*

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## Abstract

Using a sample of non-financial companies listed on the Shanghai and Shenzhen A-share markets during the period 2003 to 2015, this paper examines whether, for listed companies, abnormal audit report lags act as an early warning of the risk of a stock price crash. We find that abnormal audit report lag is positively related to the risk of a stock price crash in the future: that is, an audit report lag is an *ex ante* signal of a stock price crash. The coefficient of abnormal audit report lag is more significant in the group with low-quality internal controls and the group with insufficient audit industry expertise. This indicates that the heterogeneity of the internal control level and the expertise of the auditor industry can influence the early warning effect of the audit. From the perspective of the audit function, this study broadens the related literature on the inducement of stock price crash risk, which is of great significance for understanding the signal function of audit report lags and promoting the stable development of the capital market in China.

***Keywords*:** Abnormal Audit Report Lag, Stock Price Crash Risk, Internal Control Quality, Auditor Industry Expertise

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## I. Introduction

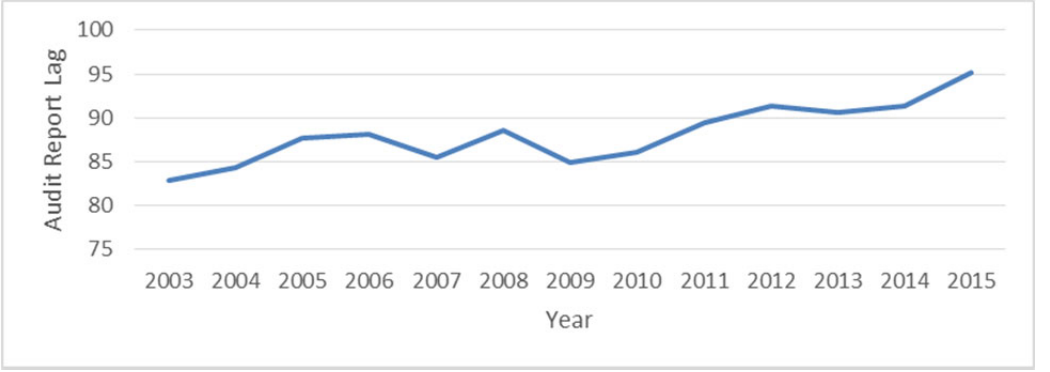
The corporate annual financial statement is one of the most fundamental and important sources of information for investors. More timely and reliable annual financial reports help investors to have a better understanding of (1) firms' financial condition and operating achievements and (2) the proposals of boards of directors so as to make more efficient investment decisions. According to the theory of information economics, the timely disclosure of accounting information can help to alleviate the information asymmetry between external investors and companies and reduce transaction costs and the possibility of insiders using information advantage to seek benefits. One prior study has shown that the more timely the disclosure of accounting information, the greater its impact will be on the capital market and the more useful it can be for investors (Chambers and Penman, 1984). However, due to the existence of the separation of control rights and cash flow rights as well as the principal-agent problem, annual reports must be audited by external auditors to ensure their reliability before they are disclosed. So, the length of time taken to audit financial statements will affect the disclosure time of those statements, and the postponement of audit reports often leads to delays in the disclosure of annual financial statements, which has a significant influence on the efficiency of the capital market.

In the prior literature, audit report lag, which is an indication of audit efficiency, is usually defined as the number of days between the fiscal year-end and the audit report date. Figure 1 depicts the trend of audit report lag for A-share non-financial companies listed on the Shanghai and Shenzhen stock markets from 2003 to 2015. As can be seen from Figure 1, the average audit days of listed companies rose by 14.5%, from 83 days in 2003 to 95 days in 2015, and the overall trend of audit report lag was upward. Most of the prior literature on audit delay has focused on the factors that affect the length of the audit lag, which can be divided two categories: audit supplier's characteristics and audit demander's characteristics (Abernathy *et al.*, 2017). However, literature on the economic consequences of audit report delays is sparse.

In theory, audit report lag sends two contrary signals. On the one hand, an audit report delay can indicate the auditor putting in more effort to increase the audit procedures and to dig out more customer misinformation, thereby reducing the possibility of management trying to hide bad news. From this point of view, an extension of the audit delay can be regarded as a signal that the company can disclose timely internal news and credible reports to the public, which will help to stabilise the capital market. On the other hand, an audit delay can reflect some issues in the financial reports since, to some extent, it is a reflection of the quality of accounting information. A delay in producing an audit report leads to the postponement of the firm's annual financial statement, and, especially when the disclosure of accounting information is over the prescribed time, it will send a strong signal to the market that the company's annual report may be deceptive and that the company's

performance may be poor, which is usually followed by a strong negative reaction, namely a sharp fall in the market stock price. However, the dominant signal that audit report lags send is still not known, and the economic consequences of abnormal audit report lags have not been determined in theory.

**Figure 1 Trend of Audit Report Lag**




Since the outbreak of the global financial crisis in 2008, sharp declines in stock prices have become increasingly frequent, and this has led to investors suffering severe financial losses. For example, at about 11 a.m. on 24 March 2017, the stock price of Huishan Dairy experienced a sudden fall-off on the Hong Kong Stock Exchange, decreasing up to 90.71%, and this created a historical record for Hong Kong stocks. Before the company temporarily suspended trading, Huishan Dairy stocks dropped from HK$3.01 to HK$0.42 per share within just 1.5 hours. In December 2016, Muddy Waters, a well-known American short-sale institution, had issued two survey reports about Huishan Dairy which directly pointed out that the value of Huishan was worthless because the company had been involved in reporting fraudulent inflated profits since 2014. The public data show that since the listing of the company, Huishan Dairy's auditor has been KPMG, one of the big four accounting firms in the world. The dates of the audit reports signed by the independent auditors for the three years from 2014 to 2016 were respectively 11 June, 22 June, and 29 June, all of which were beyond the 31 March deadline for annual reports. From this perspective, the extension of the audit report lag seems to have delivered the signal of a stock price crash.

Stock price crash risk is a new research field in finance. Since Jin and Myers (2006) pioneered the view that the centralised release of negative news hidden by managers for some self-interest is the primary reason for stock price crashes, many scholars have studied whether governance and supervision help to restrict management from hiding bad news. Internal governance factors include the transparency of financial reports (Hutton *et al.*, 2009), the earnings manipulation of management (Kim and Zhang, 2014), and the disclosure of internal control information (Ye *et al.*, 2015), and external governance factors include analyst following (Xu *et al.*, 2012), the shareholding of institutional investors (Cao *et al.*,

2015), auditor industry expertise (Jiang and Yi, 2013), and abnormal audit fees (Wan, 2015). However, few scholars have combined stock price crash risk with audit report lag. Auditors, as one of the important supervisors of the capital market, have the responsibility to ensure the reliability of financial statements and the timely disclosure of company information. The audit process directly influences the authenticity and timeliness of the information that external investors obtain, which ultimately affects the investment decisions of investors, investors' wealth, and the efficiency of the allocation of resources in the capital market. Therefore, it is of great significance to study the effect of audit report lags on future stock price crash risk. Can auditors increase the audit procedures and extend the audit scope to really improve the quality of accounting information, reduce the stock price crash risk, and maintain market stability to protect the investors? Or is it the case that audit report lags do not suggest an increase in audit quality but rather suggest errors in financial reports or management fraud to cover up a company's bad news, which are the cause of the subsequent stock price crash?

On the basis of a prior analysis, we use a large sample of non-financial A-share listed companies from 2003 to 2015 to study the relationship between stock price crash risk and abnormal audit report lag (*ARL*). Our study shows that abnormal audit report lag is positively related to the risk of a stock price crash in the future: that is, abnormal audit report lag can be used as the *ex ante* signal of a stock price crash. Moreover, the coefficient of abnormal audit report lag is more significant in the group with low-quality internal controls and the group with insufficient audit industry expertise. This indicates that the heterogeneity of the internal control level and the expertise of the auditor industry can influence the early warning effect of the audit.

The main contributions of our paper are as follows: First, the prior literature mainly emphasises the effect of accounting characteristics (e.g. comparability, conservatism) on stock price crash risk instead of the information content of the audit; our paper extends the related studies in this field from the perspective of audit report lag. Second, our paper aims to study the impact of audit report lag on future stock price crash risk and to enrich the relevant literature on the economic consequences of audit report lag; the prior literature has only focused on investigating the reasons for audit report lag. Third, our paper discards the rough measurement of audit report lag (i.e. days from the fiscal year-end to the signed date of the annual financial report). We first estimate the due days of the audit report lags of the companies by controlling the fundamental changes of the listed companies and then calculate the abnormal audit report lag. In this way, the new measurement is innovative in that it accurately depicts the potential risk or audit efforts. Fourth, our paper reveals the relationship between abnormal audit report lag and future stock price crash risk and reminds stakeholders to pay attention to audit report lags as this will help protect the wealth of investors and maintain the stability of the capital market.

The remainder of our paper proceeds as follows. Section II reviews the related literature on audit report lag and stock price crash risk and develops the hypotheses. Section III explains research design issues and provides descriptive statistics. Section IV presents the main regression results. Section V details the robustness tests. Finally, Section VI concludes the paper.

## II. Literature and Hypotheses

### 2.1 Auditor's Working Time and Auditing Quality

The audit report lag can reflect the effort of the auditor (Knechel and Payne, 2001; Knechel *et al.*, 2009). According to the level of effort and validity hypothesis, audit report lags show that auditors have made more efforts to improve audit quality. Caramanis and Lennox (2008) and Lee *et al.* (2009) find that the longer the audit time is, the more it inhibits the earnings management behaviour of managers. Therefore, the information quality of annual reports and the quality of audits can be improved if auditors make efforts to collect sufficient evidence during the extended audit time. Enlarging the scope of audits and increasing audit procedures will increase the workload of auditors. There are a series of internal and external factors in the audit process, such as time budget pressure, which will hamper auditors from finding firms' misinformation during long working hours. The *Chinese Company Law* stipulates that listed companies must disclose financial statements within four months after the financial reporting deadline. Companies with delayed disclosures are required to explain the delay and pay fines. If there is any serious violation, trading of the company's stocks will be prohibited. During the period of auditing annual reports, auditors are usually involved with a large number of companies and will inevitably face tremendous pressure. Therefore, increasing working hours for a limited time may not bring about an improvement in audit quality. Weick (1983) suggests that when time pressure increases to a certain point where it is hard to finish the task, the ability of individuals to deal with new or complex problems will be affected and they will consciously avoid anything that increases the burden of cognition. McNair (1991) holds that a limited time budget will make auditors weigh between reducing and increasing working hours, controlling audit costs, and raising audit costs, and this will increase the pressure they face. The stress auditors experience may lead to them exhibiting abnormal behaviour, because the time-constrained and concentrated work schedule usually makes them feel tired and then misbehave, resulting in a reduction in professional scepticism (Braun, 2000) and the weakening of professional judgment, with auditors even accepting customers' grudging explanations (López and Peters, 2011). Gibbins *et al.* (2001) point out that once auditors disagree with management, more meetings and negotiations will be needed with the audit committee, and this will result in a further extension of auditing time; under these circumstances, the time pressure will increase further and the quality of the audit will

probably be affected. Secondly, from the perspective of auditors' ability, auditors with industry expertise can improve the disclosure quality of financial reports (Dunn and Mayhew, 2004), whereas auditors with limited industry expertise will reduce audit effectiveness and may not be able to find evidence even if given additional work time (Romanus *et al.*, 2008).

Also, if auditors who lack specific expertise relevant to the client are employed (Myers *et al.*, 2003), they cannot fully develop their professional ability. More importantly, auditors' economic dependence on customers will reduce audit independence, professional judgment, and professional scepticism, thus reducing audit quality (Bazerman *et al.*, 1997; Ferguson *et al.*, 2004; Nelson, 2009) and the quality of accounting information in annual reports. Management can continue to conceal bad news from the public if, because of the aforementioned circumstances, auditors fail to find substantial evidence in the extended audit period or if the auditors discover but do not disclose evidence on the basis of a balance of interests. The quality of accounting information in annual reports may not be improved, and management can continue to conceal bad news from the public.

## 2.2 Stock Price Crash Risk

Jin and Myers first put forward the management blanket hypothesis in 2006 to explain why stock prices crash. The presumption holds that management conceals or delays disclosing negative information out of self-interest (promotion or raise), only releases good news, and makes the market overestimate their company's share price. If managers withhold and accumulate bad news for an extended period, negative information is likely to be stockpiled within a firm. Once the amount of accumulated bad news reaches a certain threshold, it will be released all at once, leading to stock price crashes (Jin and Myers, 2006; Hutton *et al.*, 2009). To examine whether opportunist behaviour with regard to selective information disclosure can be suppressed or not, subsequent scholars have studied the specific mechanism of stock price crashes from various aspects. Hutton *et al.* (2009) suggest that companies with opaque financial reports have a higher level of information asymmetry, a management that is more likely to hide bad news, and a greater possibility of experiencing a stock price crash. At the same time, they believe that discretionary accruals are strong predictors of a stock price crash. Jiang and Yi (2013) find that when companies employ accounting firms with stronger industry expertise, their stock price crash risk will be decreased. Wan (2015) finds that the higher the audit fees, the lower the stock price crash risk. Francis *et al.* (2016) examine the relationship between abnormal business behaviour and stock price crash risk using the real earnings management model, and they find that deviation from the normal real business activities of the company and the industry is one of the factors that affect stock price crash. At the same time, the greater the likelihood that a company manipulates its real earnings upward, the greater the likelihood that it will experience a stock price crash in the future. Huang and Wu (2017) show that stock price

crash risk will be significantly reduced with continuous improvement of the quality of internal controls. Generally, managers trying to hide negative news and not disclosing such news in a timely manner is an important predictor of companies experiencing a stock price crash in the future.

## 2.3 Abnormal Audit Report Lag and Stock Price Crash Risk

The purpose of our paper is to examine the relationship between abnormal audit report lag and future stock price crash risk. However, the relationship is uncertain in theory. On the one hand, according to the hypothesis on the effectiveness and degree of effort, the information quality of the financial statements disclosed by listed companies will be improved if auditors find more substantive evidence about misreporting by increasing audit procedures, expanding the scope of the audit in the extension period, and urging management to disclose financial statements in a truthful way. In this case, the opportunist motivation for management to try to hide bad news will be suppressed, negative news can be disclosed to the public in a timely manner, and companies' risk of experiencing a stock price crash will be lower. On the other hand, as mentioned above, for various reasons (time pressure, personal ability, initial audit, economic dependence), an increase of working hours may not bring about an improvement of audit quality and internal news may still not be disclosed to investors in a timely manner. The reasons for audit report lags are considered as starting points for investigations. When customers have high earnings manipulation risks (Bedard and Johnstone, 2004) or auditors have doubts about the accounting treatment of audited units and suspect the authenticity of their earnings (Chan *et al.*, 2016), auditors will extend their working time. Therefore, audit delay is often related to a company's bad news rather than to its good news. It can be said that audit report lag is itself the direct embodiment of low transparency and a high degree of earnings management among listed companies, which reflects the intention of management to hide bad news through some accounting methods. These factors are no doubt a catalyst for stock price crashes (Jin and Myers, 2006; Hutton *et al.*, 2009; Francis *et al.*, 2016).

In short, the time lag of abnormal audit reports has both a positive and a negative effect on stock price crash risk. This is an empirical question. On this basis, we propose the following two competing hypotheses:

**Hypothesis H1a: The longer the time lags of abnormal audit reports of listed companies, the smaller the stock price crash risk.**

**Hypothesis H1b: The longer the time lags of abnormal audit reports of listed companies, the greater the stock price crash risk.**

## 2.4 Abnormal Audit Report Lag, Internal Governance, and Stock Price Crash Risk

The core objective of the implementation of internal controls is to comply with relevant laws and regulations, to improve operational efficiency while reasonably ensuring the reliability of financial statements, and to lay the foundation for the long-term development of enterprises. Many prior studies have shown that high-quality internal controls can significantly inhibit managers' earnings management behaviour; promote the timely confirmation and measurement of accounting information, especially negative accounting information; and enhance the transparency of financial reporting (Sun and Yang, 2013), thereby improving the quality of financial reporting (Fang and Jin, 2013). Thus, internal controls can decrease the degree of information asymmetry between enterprises and investors, inhibit management's motive to hide bad news, and reduce the risk of future stock price crash (Huang and Wu, 2017).

If there is a significant negative correlation between abnormal audit report lag and future stock price crash risk (i.e. hypothesis H1a holds), it means that the abnormal audit lag indicates that auditors add more audit input during the audit process, find more proof about financial misstatement by increasing audit procedures and expanding the scope of the audit, and urge the management to truthfully disclose financial statements, which helps to restrain management from manipulating information. Then, effective internal controls can play a synergistic role by setting up a reward and punishment mechanism in advance, conducting risk assessment and risk control activities during the event, and increasing information communication and internal supervision after the event, and further inhibit the long-term accumulation of negative news: that is, effective internal controls can strengthen the negative impact of abnormal audit report lag on stock price crash risk.

If there is a significant positive correlation between abnormal audit reporting lag and future stock price crash risk (i.e. hypothesis H1b holds), it means that abnormal audit report lag is more likely to be indicative of management's information-hiding behaviour, which will increase the probability of a future stock price crash (Jin and Myers, 2006; Hutton *et al.*, 2009). Sound internal controls can enhance the transparency of financial reports through pre-event, in-event, and post-event multidimensional controls; promote the timely recognition and measurement of accounting information, especially negative accounting information; and then reduce the risk of the future stock price crash: that is, effective internal controls can weaken the positive impact of abnormal audit report lag on stock price crash risk. On the basis of hypotheses H1a and H1b, we separately put forward the following hypotheses:

**Hypothesis H2a: The higher the internal control quality, the more negative the impact of abnormal audit report lag on stock price crash risk.**

**Hypothesis H2b: The higher the internal control quality, the less positive the impact of abnormal audit report lag on stock price crash risk.**

## 2.5 Abnormal Audit Report Lag, Auditor Industry Expertise, and Stock Price Crash Risk

Industry expertise is the professional skills and experience of an auditor in one or several industries and is an important embodiment of the high ability of the auditor. The professional knowledge of auditors, such as their knowledge of production and operation characteristics, economic and technical indicators, and special accounting rules, is conducive to enhancing their professional judgment ability and improving the capability and efficiency of collecting audit proof. Prior studies have shown that auditors with a high level of industry expertise are more sensitive to business changes in listed companies and more accurate in identifying uncertainties (Xie, 2011). Furthermore, auditor industry expertise can inhibit managers' earnings management behaviour and identify bad news in a more timely manner (Krishnan, 2005). As a result, auditors with higher industry expertise are more likely to discover management's hiding of negative news through information manipulation during the audit process. Thus, auditors who have high industry expertise can help to encourage listed companies to disclose bad news promptly, thus increasing transparency in financial reporting and reducing management's earnings manipulation (Jiang and Yi, 2013).

If there is a significant negative correlation (i.e. if hypothesis H1a holds) between abnormal audit report lag and future stock price crash risk, it means that the abnormal audit report lag is more representative of the auditor's input. Auditors with higher industry expertise are more capable of assessing customer exposure, collecting audit evidence, and formulating and modifying audit plans, thus more accurately assessing clients' accounting estimates and financial statements. Finally, the rationality of the financial statement can better distinguish the information manipulation activities of the client firm: that is, the auditor's industry expertise can reduce the risk of false financial statements by detecting and restraining the management's information-hiding behaviour in time and further strengthen the negative impact of abnormal audit report lag on stock price crash risk.

If there is a significantly positive correlation between abnormal audit report delay and future stock price crash risk (i.e. hypothesis H1b holds), abnormal audit report delay is more representative of management's information-hiding behaviour. Auditors with higher industry expertise will tolerate a lower risk of false restatement to maintain their reputation, and they have a stronger motivation and higher ability to enhance the screening and judgment of uncertainties and to discover and suppress the bad news hidden in client companies in a more timely manner, thereby weakening the positive relationship between abnormal audit report lag and future stock price crash risk. On the basis of hypotheses H1a and H1b, we separately put forward the following hypotheses:

**Hypothesis H3a: If audit firms have industry expertise, the negative impact of abnormal audit report lag on stock price crash risk will be more pronounced.**

**Hypothesis H3b: If audit firms have industry expertise, the positive effect of**

**abnormal audit report lag on stock price crash risk will be less pronounced.**

## III. Research Design

### 3.1 Model Setup and Variable Measurement

We use the following model (1) to test hypothesis 1:

$$Crash_{i,t+1} = \alpha + \beta_1 ARL_{i,t} + Control + Year + Ind + \varepsilon, \quad (1)$$

where *Crash* is the company's stock price crash risk, *ARL* is the abnormal audit report lag, and *Control* is the control variables. On the basis of model (1), we further test how *ARL* affects *Crash* under different levels of firm's internal and external governance. We use internal control level to proxy for the internal governance level and auditor industry expertise to proxy for the external governance level. The quality of internal control is grouped by the median of the industry; auditing industry expertise is represented by the industry portfolio share; and another measure, industry market share, is used as the robustness test. Definitions of the main variables are presented in Appendix A.

#### 3.1.1 Abnormal audit report lag

In the prior literature, audit report lag has been defined as the days between the fiscal year-end and the date of the disclosure of the annual report. We argue that this measure is too crude to control for fundamental factors (e.g. number of subsidiaries of the auditees) of a company, whether there were mergers or reorganisations in the current year, the influence of business volume, and the factors of an audit. First, we construct model (2) as below and use the fundamentals of listed companies (that affect audit report lag). The logarithm of the days between the fiscal year-end and the signing date of the annual financial report is used as the dependent variable (*Lag*) to conduct the regression of these factors. Then, we estimate the number of normal days required to finish the audit and disclose the annual financial report after considering the fundamental factors. Second, we take the residual of model (2) as the abnormal audit report lag (*ARL*) and then bring it into the main model (1) for further regression:

$$\begin{aligned} Lag_{i,t} = {} & \alpha_{i,t} + \beta_1 Lag_{i,t-1} + \beta_2 Size_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 Merge_{i,t} \\ & + \beta_5 Subnum_{i,t} + \beta_6 Complex_{i,t} + \beta_7 Cr_{i,t} + \beta_8 Roa_{i,t} \\ & + \beta_9 Loss_{i,t} + \beta_{10} Growth_{i,t} + \beta_{11} Mtb_{i,t} + \beta_{12} Age_{i,t} \\ & + \beta_{13} Accrual_{i,t} + \beta_{14} Big4_{i,t} + \beta_{15} Opinion_{i,t} + \varepsilon_{i,t}, \end{aligned} \quad (2)$$

where *Lag* is the logarithm of the days between the fiscal year-end and the disclosure date of the annual financial report; *Size* represents the scale of a firm and is measured by the logarithm of the firm's total assets in year *t*-1; *Leverage* is financial leverage, which is measured by the ratio of total debt to total assets in year *t*-1; *Merge* is a dummy which

indicates whether the firm conducts mergers and acquisitions in the current year; *Subnum* is measured by the logarithm of the number of subsidiaries plus 1; *Complex* represents the turnover of inventory and accounts receivable, measured by (inventory + accounts receivable) / total assets in year *t*-1; *Cr* represents the liquidity of a firm measured by current ratio, which is the ratio of current assets to current debt in year *t*-1; *Loss* refers to the profitability of a firm and is a dummy which indicates whether the firm undergoes a loss; *Growth* is the growth rate of main operating income; *Mtb* is the market-to-book ratio of assets; *Age* is the listed age of a firm, represented by the logarithm of one plus a firm's listed age; *Accrual* is total accruals, represented by net earnings minus net operating cash flow in year *t*; *Big4* is a dummy variable which represents the risk control quality of audit firm and equals 1 if the audit firm is one of the Big 4 auditing firms and 0 otherwise; and *Opinion* is the type of lagged audit opinion for a client and equals 1 if a qualified audit opinion (including a disclaimer of opinion，an adverse opinion, a qualified opinion, or an unqualified opinion with an emphasis of matter paragraph) is issued in the previous year and 0 otherwise.

### 3.1.2 Stock price crash risk

Referring to prior studies (Kim *et al.*, 2011a, 2011b; Xu *et al.*, 2012), the risk of stock price crash represented by *Crash* is calculated by the following two models:

$$R_{i,t} = \alpha_{i,t} + \beta_1 R_{m,t-2} + \beta_2 R_{m,t-1} + \beta_3 R_{m,t} + \beta_4 R_{m,t+1} + \beta_5 R_{m,t+2} + \varepsilon_{i,t} \quad (3)$$

$$NCSKEW_{i,t} = -\left[n(n-1)^{\frac{3}{2}} \sum W_{i,t}^3\right] / \left[(n-1)(n-2)(\sum W_{i,t}^2)^{3/2}\right] \quad (4)$$

$$DUVOL_{i,t} = log\{\left[(n_u - 1)\sum_{DOWN} W_{i,t}^2\right] / \left[(n_d - 1)(\sum_{UP} W_{i,t}^2)\right]\}, \quad (5)$$

where $R_{i,t}$ is the return rate of company *i* in week *t* and $R_{m,t}$ is the weighted average return rate of the market in week t. The two indexes, *NCSKEW* and *DUVOL*, are used to measure stock price crash risk.

Following Chen *et al.* (2001) and Jin and Myers (2006), our first measure of crash risk is calculated as the negative skewness of firm-specific weekly returns (*NCSKEW*). Specifically, we calculate *NCSKEW* for a given firm in a fiscal year by taking the negative of the third moment of firm-specific weekly returns for each sample year and dividing it by the standard deviation of firm-specific weekly returns raised to the third power. The larger the *NCSKEW*, the greater the negative degree of the company's stock yield skew coefficient and the greater the stock price crash risk. Following Chen *et al.* (2001), our second measure is the asymmetric volatility of negative versus positive returns (*DUVOL*). For each firm *j* over a fiscal year *t*, we separate all the weeks with firm-specific weekly returns below the annual mean ("down" weeks) from those with firm-specific returns above the annual mean ("up" weeks) and calculate the standard deviation for each of these subsamples separately. The variable *DUVOL* is the log of the ratio of the standard deviation on the down weeks to

the standard deviation on the up weeks. The higher the *DUVOL*, the higher the rate of return skewed to the left and the higher the stock price crash risk.

Because we want to test how *ARL* affects the future stock price crash risk of a company, the dependent variables are the negative conditional return skewness in the next year, *FNCSKEW*, and the asymmetric volatility of negative versus positive returns in the next year, *FDUVOL*. In addition, we use the dummy variable indicating whether there will be a stock price crash in the future, *Fcrash*, as the dependent variable for the robustness test.

### 3.1.3 Other variables

We further test how *ARL* affects *Crash* under different levels of firm's internal and external governance. The quality of internal control is represented by *IC*, which is taken from the internal control index of the DIB database and measured by the logarithm of one plus the value of the internal control index, and *IPS*, auditing industry expertise, is calculated as follows:

$$IPS_{i,k} = \frac{\sum_{j=1}^{J} REV_{i,k,j}}{\sum_{k=1}^{K}\sum_{j=1}^{J} REV_{i,k,j}}, \tag{6}$$

where the numerator is the total business income of clients in industry *k* to which accounting firm *i* belongs, and the denominator is the total business income of all clients of firm *i*. The industry with the highest share of each accounting firm's industry portfolio is defined as its industry expertise, and the dummy variable *IPS_Dum* equals 1, and 0 otherwise.

The other control variables of the main model are as follows: the negative conditional return skewness in the current period ($NCSKEW$) and the asymmetric volatility of negative versus positive returns in the current period ($DUVOL$); the annual average weekly return on stocks (*Ret*); the market-to-book ratio of assets (*Mtb*); company size (*Size*); asset-liability ratio (*Leverage*) and current ratio (*Cr*); operating performance (*Roa*); whether there is a loss in the current year (*Loss*); whether the firm is audited by a Big 4 auditor; and the logarithm of audit fee (*Lnfee*). Specific definitions of the variables are presented in Appendix A.

## 3.2 Data Source and Sample Selection

We use a sample of A-share companies listed on the Shanghai and Shenzhen stock markets from 2003 to 2015. The internal control data come from the Chinese Listed Company Internal Control Index issued by DIB Enterprise Risk Management Technology Co Ltd, and other financial data are from the CSMAR database. It should be noted that for the observations where the audit report lag exceeds the maximum number of days (120 days) or is less than one day, as specified in the audit standards, we verify them one by one by rechecking the annual report disclosed by the listed firm and recalculating the time lag of the audit report so as to ensure the quality of the data. On the basis of the above initial sample, we exclude financial and insurance listed firms, special treatment (ST) firms, and

firms with missing variables. Finally, we obtain 17,392 observations. To mitigate the effect of outliers, we winsorise the continuous variables at the 1% level in both tails.

## IV. Empirical Results

### 4.1 Descriptive Statistics

Table 1 reports the descriptive statistics of the winsorised variables. The maximum and minimum values of *FNCSKEW* and *FDUVOL* as future stock price crash indicators are respectively -2.973, 2.32 and -1.527, 2.308; the standard deviations of *FNCSKEW* and *FDUVOL* are 0.991 and 0.756, respectively; and the 0.25 and 0.75 quantiles are respectively -0.822, 0.432 and -0.252, 0.721, which suggest that there is a great difference between the two variables in the sample companies. The mean of abnormal audit report lag, which is estimated by model (2), is close to 0, but the 0.25 and 0.75 quantiles are -0.097 and 0.137 and the standard deviation is 0.213, with a range of -0.777 to 0.434, which shows that some firms do have abnormal audit report lags. The median of abnormal audit report lag (*ARL*) is 0.017, which means that the audit report lag of half of the firms is less than 1.017(e^0.017= 1.017) days and the audit report lag of half of the firms is more than 1.017 days. We also find that the average number of audit days of listed companies rose by 14.5%, from 83 days in 2003 to 95 days in 2015, and the overall trend of audit report lag is upward. From the means, medians, quantiles, and standard deviations of the other variables, the distribution is within a reasonable range and demonstrates a certain difference in the sample period.

**Table 1 Descriptive Statistics**

| Variable | N | St. Dev. | Mean | P25 | P50 | P75 | Min | Max |
|---|---|---|---|---|---|---|---|---|
| *FNCSKEW* | 17392 | 0.991 | -0.214 | -0.822 | -0.180 | 0.432 | -2.973 | 2.320 |
| *FDUVOL* | 17392 | 0.756 | 0.248 | -0.252 | 0.222 | 0.721 | -1.527 | 2.308 |
| *ARL* | 17392 | 0.213 | 0.001 | -0.097 | 0.017 | 0.137 | -0.777 | 0.434 |
| *NCSKEW* | 17392 | 0.942 | -0.206 | -0.766 | -0.159 | 0.427 | -2.933 | 2.031 |
| *DUVOL* | 17392 | 0.724 | 0.257 | -0.226 | 0.241 | 0.722 | -1.472 | 2.170 |
| *Ret* | 17392 | 0.665 | -0.152 | -0.534 | -0.145 | 0.244 | -2.106 | 1.685 |
| *Mtb* | 17392 | 1.770 | 2.440 | 1.346 | 1.860 | 2.825 | 0.892 | 11.590 |
| *Size* | 17392 | 1.239 | 21.840 | 20.960 | 21.680 | 22.530 | 19.240 | 25.660 |
| *Lev* | 17392 | 0.213 | 0.472 | 0.312 | 0.478 | 0.628 | 0.054 | 1.085 |
| *Cr* | 17392 | 2.278 | 2.073 | 0.971 | 1.396 | 2.195 | 0.214 | 15.800 |
| *Roa* | 17392 | 0.058 | 0.035 | 0.012 | 0.033 | 0.062 | -0.250 | 0.197 |
| *Loss* | 17392 | 0.295 | 0.097 | 0 | 0 | 0 | 0 | 1 |
| *Big4* | 17392 | 0.231 | 0.056 | 0 | 0 | 0 | 0 | 1 |
| *Lnfee* | 17392 | 0.720 | 13.460 | 12.980 | 13.310 | 13.820 | 12.210 | 16.260 |

**Table 2 Pearson Correlation Coefficients**

| | *FNCSKEW* | *FDUVOL* | *ARL* | *NCSKEW* | *DUVOL* | *Ret* | *Mtb* | *Size* | *Leverage* | *Cr* | *Roa* | *Loss* | *Big4* | *Lnfee* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *FNCSKEW* | 1 | | | | | | | | | | | | | |
| *FDUVOL* | 0.903*** | 1 | | | | | | | | | | | | |
| *ARL* | 0.018** | 0.024*** | 1 | | | | | | | | | | | |
| *NCSKEW* | -0.055*** | -0.071*** | -0.026*** | 1 | | | | | | | | | | |
| *DUVOL* | -0.081*** | -0.115*** | -0.028*** | 0.894*** | 1 | | | | | | | | | |
| *Ret* | 0.152*** | 0.173*** | 0.022*** | -0.586*** | -0.679*** | 1 | | | | | | | | |
| *Mtb* | 0.063*** | 0.045*** | -0.00100 | -0.017** | -0.00700 | 0.060*** | 1 | | | | | | | |
| *Size* | -0.073*** | -0.084*** | 0 | -0.132*** | -0.147*** | 0.085*** | -0.372*** | 1 | | | | | | |
| *Leverage* | -0.052*** | -0.060*** | -0.00100 | -0.061*** | -0.066*** | 0.051*** | -0.252*** | 0.321*** | 1 | | | | | |
| *Cr* | 0.054*** | 0.063*** | 0.00200 | 0.059*** | 0.063*** | -0.058*** | 0.232*** | -0.225*** | -0.620*** | 1 | | | | |
| *Roa* | -0.00100 | -0.027*** | 0 | -0.00800 | -0.020*** | 0.027*** | 0.196*** | 0.096*** | -0.399*** | 0.217*** | 1 | | | |
| *Loss* | 0.016** | 0.033*** | 0.00100 | 0.018** | 0.023*** | -0.00400 | 0.0120 | -0.109*** | 0.218*** | -0.108*** | -0.651*** | 1 | | |
| *Big4* | -0.026*** | -0.034*** | -0.00100 | -0.036*** | -0.046*** | 0.033*** | -0.086*** | 0.320*** | 0.039*** | -0.072*** | 0.070*** | -0.038*** | 1 | |
| *Lnfee* | -0.056*** | -0.058*** | 0.00900 | -0.108*** | -0.105*** | 0.050*** | -0.173*** | 0.760*** | 0.210*** | -0.171*** | 0.055*** | -0.043*** | 0.441*** | 1 |

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

## 4.2 Correlation Analysis

Table 2 reports the Pearson correlation coefficients for the main variables. The correlation coefficients of the two stock price crash indicators are about 0.903 and significantly positive at the 1% level, suggesting that they have better consistency. The correlation coefficients of *ARL*, *FNCSKEW*, and *FDUVOL* are positive and are at least significant at the 5% level; this shows that a firm's abnormal audit report lag is positively related to the firm's future stock price crash risk without considering other factors, which is in line with the expectation of hypothesis H1b: that is, the longer the abnormal audit report lag of the listed firm, the greater the risk of a stock price crash in the future.

## 4.3 Analysis of Regression Results

### 4.3.1 Estimating for abnormal audit report lag (*ARL*)

The first and second columns of Table 3 report the results from estimating Eq. (2). We require a minimum of 15 observations per regression and run the model by year and industry. We add the variables of audit firms and auditors in Eq. (7) based on Eq. (2), considering that the characteristics of different audit firms and auditors are not included in Eq. (2). The results from estimating Eq. (7) are presented in the third and fourth columns of Table 3.

$$\begin{aligned} Lag_{i,t} = {} & \alpha_{i,t} + \beta_1 Lag_{i,t-1} + \beta_2 Size_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 Merge_{i,t} \\ & + \beta_5 Subnum_{i,t} + \beta_6 Complex_{i,t} + \beta_7 Cr_{i,t} + \beta_8 Roa_{i,t} + \beta_9 Loss_{i,t} \\ & + \beta_{10} Growth_{i,t} + \beta_{11} Mtb_{i,t} + \beta_{12} Age_{i,t} + \beta_{13} Accrual_{i,t} \\ & + \beta_{14} Big4_{i,t} + \beta_{15} Opinion_{i,t} + \beta_{16} Auditfirms_{i,t} \\ & + \beta_{17} Auditors_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{7}$$

**Table 3 Estimating for Abnormal Audit Report Lag (*ARL*)**

| Variables | Eq. (2) | | Eq. (7) | |
|---|---|---|---|---|
| | (1) coefficient | (2) t-stat | (3) coefficient | (4) t-stat |
| $Lag_{t-1}$ | 0.289* | 2.460 | 0.289* | 2.542 |
| Controls | Yes | | Yes | |
| Audit firms | | | Yes | |
| Auditors | | | Yes | |
| Constant | 2.953* | 3.002 | 2.119* | 2.384 |
| Adj. $R^2$ (mean) | 0.1781 | | 0.1753 | |

Note: Eq. (2) reports the mean coefficient estimates and Newey-West adjusted t-statistics from cross-sectional OLS regressions of audit report lag, *Lag*, on the following: company size (*Size*); financial leverage (*Leverage*); the dummy variable indicating whether or not a firm conducts mergers and acquisitions (*Merge*); the number of subsidiaries (*Subnum*); the turnover of inventory and accounts receivable (*Complex*); current ratio (*Cr*); the profitability of a firm (*Loss*); the growth rate of main operating income (*Growth*); the market-to-book ratio of assets (*Mtb*); the listed age of a firm (*Age*); total accruals (*Accrual*); the dummy variable indicating whether the audit firm comes from the Big 4 auditing firms or not (*Big4*); the type of lagged audit opinion for the client (*Opinion*), estimated by year and industry. The third and fourth columns report the mean coefficient estimates and Newey-West adjusted t-statistics from the cross-sectional OLS regressions of Eq. (7), estimated by year and industry.

There is no significant difference between Eq. (2) and Eq. (7) in terms of the coefficients of $Lag_{t-1}$ and the other variables. The adjusted R-squared is 17.81% in Eq. (2) and 17.53% in Eq. (7), which shows that the equations fit well. In Eq. (7), the mean of *ARL* is 0.001 and the median of *ARL* is 0.012, which are not significantly different from the mean (0.001) and median (0.017) in Eq. (2).

### 4.3.2 Abnormal audit report lag and future stock price crash risk

Table 4 reports the results for hypothesis H1a (H1b). In column (1), *FNCSKEW* is used as the stock price crash risk indicator, and we find that the coefficient of *ARL* is 0.117, which is significant at the 1% level. In column (2), we add a series of control variables which affect the future risk of a stock price crash, and *FNCSKEW* is still significantly positive at the 5% level. At the same time, the adjusted $R^2$ rises from 0.0265 to 0.0743,

**Table 4 Abnormal Audit Report Lag and Future Stock Price Crash Risk**

| Variables | (1) *FNCSKEW* | (2) *FNCSKEW* | (3) *FDUVOL* | (4) *FDUVOL* |
|---|---|---|---|---|
| *ARL* | 0.117*** | 0.091** | 0.102*** | 0.079*** |
| | (0.002) | (0.013) | (0.001) | (0.005) |
| *NCSKEW* | | -0.086*** | | |
| | | (0.000) | | |
| *DUVOL* | | | | -0.136*** |
| | | | | (0.000) |
| *Ret* | | 0.246*** | | 0.175*** |
| | | (0.000) | | (0.000) |
| *Mtb* | | -0.010 | | -0.019*** |
| | | (0.220) | | (0.004) |
| *Size* | | -0.057** | | -0.057*** |
| | | (0.020) | | (0.002) |
| *Leverage* | | 0.036 | | -0.019 |
| | | (0.698) | | (0.787) |
| *Cr* | | 0.015** | | 0.012** |
| | | (0.043) | | (0.033) |
| *Roa* | | -0.412* | | -0.653*** |
| | | (0.074) | | (0.000) |
| *Loss* | | 0.043 | | 0.033 |
| | | (0.264) | | (0.250) |
| *Big4* | | -0.019 | | -0.007 |
| | | (0.759) | | (0.893) |
| *Lnfee* | | 0.071** | | 0.029 |
| | | (0.039) | | (0.258) |
| Constant | -0.214*** | 0.120 | 0.155*** | 1.140*** |
| | (0.000) | (0.816) | (0.000) | (0.003) |
| Observations | 17,392 | 17,392 | 17,392 | 17,392 |
| Year/Industry | Fixed | Fixed | Fixed | Fixed |
| Adj. $R^2$ | 0.0265 | 0.0743 | 0.0433 | 0.1081 |
| F | 34.37 | 60.47 | 50.59 | 87.52 |

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

which indicates that the explanatory power of the model is further improved after adding the control variables. Similarly, in column (3) and column (4), we use the second variable, *FDUVOL*, to proxy for future stock price crash risk, and the conclusions obtained remain unchanged. Thus, hypothesis H1b is verified: Abnormal audit report lag is significantly positively correlated with stock price crash risk: that is, the longer the abnormal audit report lag of the listed company, the more likely it is that the company will experience a crash in the future.

Regarding the control variables, the current stock price crash risk variables *NCSKEW* and *DUVOL* are significantly negatively correlated with the future share price crash risk variables *FNCSKEW* and *FDUVOL*. Annual average weekly return on stocks (*Ret*) and liquidity (*Cr*) are positively correlated with stock price crash risk. Market-to-book ratio (*Mtb*), company size (*Size*), and return on assets (*Roa*) are negatively correlated with future stock price crash. These results are consistent with those of previous studies. In addition, the coefficient of auditing expenses in column (2) is significantly negative. This may be because high audit fees are positively related to audit opinion purchase behaviours: A company's management will entice auditors with high audit fees to gain their help in concealing the company's negative news, resulting in a rising risk of a stock price crash.

In summary, after controlling for other factors, abnormal audit report lag is significantly positively correlated with stock price crash risk: that is, the longer the abnormal audit report lag of the listed company, the more likely it is that the company will experience a crash in the future. This supports hypothesis H1b but does not support hypothesis H1a.

### 4.3.3 Internal control, abnormal audit report lag, and future stock price crash risk

By using multiplier items and grouping regression analysis, we check the moderation effect of internal control on audit report lag and stock price crash risk. Table 5 reports the test results for the multiplier items (first column and fourth column) and the by-group analysis (columns (2), (3), (5), and (6)).

In the first and fourth column of Table 5, we report the multivariate results on the association between audit report lag and future stock price crash risk to determine whether different internal governance mechanisms will influence the relationship between audit report lag and stock price crash risk (H2). The coefficient of audit report lag multiplied by internal control (*ARL×IC*) in column (1) is significantly negative, which means that good internal control can weaken the positive impact of abnormal audit report lag on stock price crash risk. For the entire sample, we only find weak evidence of an association between *ARL×IC* and stock price crash—specifically, when the dependent variable is *FNCSKEW*.

We divide our samples into two groups—high internal control quality and low internal control quality—and test how abnormal audit report lag affects future stock price crash risk under different internal governance mechanisms. Table 5 reports the test results for

hypothesis H2a (H2b). From Table 5, we can see that according to the level of internal control quality, when the dependent variable is *FNCSKEW*, the coefficient of abnormal audit report lag (*ARL*) in the group with higher internal control quality is not significant, while the coefficient of abnormal audit report lag (*ARL*) in the group with low internal control quality is significantly positive at the 1% level. We further use the bootstrap method to test the significance of the differences between the two groups. The test results show that the

**Table 5 Internal Control, Abnormal Audit Report Lag, and Future Stock Price Crash Risk**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | High | Low | | High | Low |
| Variables | All | *FNCSKEW* | *FNCSKEW* | All | *FDUVOL* | *FDUVOL* |
| *ARL×IC* | -0.090** | | | -0.047 | | |
| | (0.038) | | | (0.159) | | |
| *ARL* | 0.483* | 0.024 | 0.207*** | 0.226 | 0.034 | 0.171*** |
| | (0.085) | (0.667) | (0.000) | (0.300) | (0.426) | (0.000) |
| *IC* | -0.027** | | | -0.024*** | | |
| | (0.015) | | | (0.004) | | |
| *NCSKEW* | -0.086*** | -0.110*** | -0.078*** | | | |
| | (0.000) | (0.000) | (0.000) | | | |
| *DUVOL* | | | | -0.137*** | -0.152*** | -0.122*** |
| | | | | (0.000) | (0.000) | (0.000) |
| *Ret* | 0.244*** | 0.228*** | 0.254*** | 0.174*** | 0.176*** | 0.179*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *Mtb* | -0.011 | 0.013 | -0.021* | -0.020*** | -0.000 | -0.032*** |
| | (0.192) | (0.329) | (0.092) | (0.003) | (0.967) | (0.001) |
| *Size* | -0.049** | -0.032 | -0.073* | -0.050*** | -0.018 | -0.085*** |
| | (0.048) | (0.433) | (0.054) | (0.007) | (0.564) | (0.003) |
| *Leverage* | 0.012 | -0.274 | 0.256** | -0.040 | -0.299** | 0.162* |
| | (0.896) | (0.104) | (0.044) | (0.567) | (0.019) | (0.083) |
| *Cr* | 0.015* | 0.022 | 0.016 | 0.012** | 0.011 | 0.012 |
| | (0.050) | (0.104) | (0.125) | (0.039) | (0.273) | (0.144) |
| *Roa* | -0.368 | -0.836* | -0.430 | -0.619*** | -1.006*** | -0.652*** |
| | (0.107) | (0.076) | (0.145) | (0.001) | (0.005) | (0.006) |
| *Loss* | 0.032 | -0.071 | 0.041 | 0.024 | 0.023 | 0.024 |
| | (0.406) | (0.625) | (0.380) | (0.418) | (0.837) | (0.493) |
| *Big4* | -0.020 | -0.087 | 0.070 | -0.007 | -0.064 | 0.042 |
| | (0.749) | (0.264) | (0.503) | (0.879) | (0.275) | (0.646) |
| *Lnfee* | 0.068** | 0.071 | 0.036 | 0.027 | 0.033 | -0.001 |
| | (0.045) | (0.137) | (0.518) | (0.287) | (0.373) | (0.971) |
| Constant | 0.167 | -0.268 | 0.772 | 1.183*** | 0.428 | 1.995*** |
| | (0.745) | (0.745) | (0.349) | (0.002) | (0.496) | (0.001) |
| Observations | 17,392 | 8,768 | 8,624 | 17,392 | 8,768 | 8,624 |
| Year/Industry | Fixed | Fixed | Fixed | Fixed | Fixed | Fixed |
| Adj. $R^2$ | 0.0750 | 0.0794 | 0.0844 | 0.1088 | 0.1042 | 0.1289 |
| F | 56.31 | 27.33 | 28.52 | 80.99 | 34.74 | 43.46 |
| Coef. Diff | | 0.183*** | | | 0.137*** | |
| | | (0.000) | | | (0.010) | |

Note: In parentheses are the p-values based on robust standard errors clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using robust standard errors.

difference between the two groups of factors is 0.183 (0.207−0.024) and significant at the 1% level. This verifies hypothesis H2b. The result is similar when the dependent variable is *FDUVOL*: that is, compared with companies with high internal control quality, abnormal audit report lag has a greater and more significant impact on the stock price crash risk of companies with lower internal control quality. Overall, our findings provide support for hypothesis H2b.

**Table 6 Auditor Industry Expertise, Abnormal Audit Report Lag, and Future Stock Price Crash Risk**

| Variables | (1) All | (2) Expertise *FNCSKEW* | (3) No expertise *FNCSKEW* | (4) All | (5) Expertise *FDUVOL* | (6) No expertise *FDUVOL* |
|---|---|---|---|---|---|---|
| *ARL×IPS* | -0.748*** | | | -0.508** | | |
| | (0.008) | | | (0.024) | | |
| *ARL* | 0.169*** | -0.063 | 0.119*** | 0.131*** | -0.037 | 0.100*** |
| | (0.001) | (0.532) | (0.003) | (0.001) | (0.623) | (0.001) |
| *IPS* | 0.028 | | | 0.074 | | |
| | (0.851) | | | (0.495) | | |
| *NCSKEW* | -0.086*** | -0.100*** | -0.091*** | | | |
| | (0.000) | (0.002) | (0.000) | | | |
| *DUVOL* | | | | -0.136*** | -0.167*** | -0.139*** |
| | | | | (0.000) | (0.000) | (0.000) |
| *Ret* | 0.245*** | 0.337*** | 0.234*** | 0.175*** | 0.221*** | 0.169*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *Mtb* | -0.010 | 0.018 | -0.012 | -0.019*** | 0.013 | -0.022*** |
| | (0.222) | (0.582) | (0.183) | (0.004) | (0.659) | (0.002) |
| *Size* | -0.057** | 0.088 | -0.062** | -0.058*** | 0.065 | -0.066*** |
| | (0.019) | (0.201) | (0.021) | (0.002) | (0.209) | (0.001) |
| *Leverage* | 0.037 | -0.098 | -0.005 | -0.019 | 0.143 | -0.073 |
| | (0.693) | (0.794) | (0.961) | (0.789) | (0.617) | (0.316) |
| *Cr* | 0.015** | 0.032 | 0.012 | 0.012** | 0.031 | 0.009 |
| | (0.043) | (0.287) | (0.130) | (0.033) | (0.154) | (0.122) |
| *Roa* | -0.413* | 0.622 | -0.579** | -0.656*** | 0.514 | -0.802*** |
| | (0.073) | (0.375) | (0.019) | (0.000) | (0.326) | (0.000) |
| *Loss* | 0.042 | 0.232** | 0.016 | 0.033 | 0.203** | 0.011 |
| | (0.268) | (0.038) | (0.692) | (0.255) | (0.019) | (0.718) |
| *Big4* | -0.018 | 1.179** | -0.013 | -0.004 | 1.028** | -0.009 |
| | (0.772) | (0.041) | (0.834) | (0.928) | (0.013) | (0.857) |
| *Lnfee* | 0.071** | -0.085 | 0.081** | 0.029 | -0.057 | 0.031 |
| | (0.038) | (0.434) | (0.029) | (0.252) | (0.440) | (0.256) |
| Constant | 0.123 | -1.105 | 0.150 | 1.136*** | -0.624 | 1.331*** |
| | (0.811) | (0.467) | (0.794) | (0.003) | (0.590) | (0.002) |
| Observations | 17,392 | 2,036 | 15,356 | 17,392 | 2,036 | 15,356 |
| Year/Industry | Fixed | Fixed | Fixed | Fixed | Fixed | Fixed |
| Adj. $R^2$ | 0.0746 | 0.1169 | 0.0739 | 0.1083 | 0.1507 | 0.1084 |
| F | 55.86 | 13.56 | 51.68 | 80.63 | 18.46 | 75.03 |
| Coef. Diff | | 0.182* | | | 0.137* | |
| | | (0.080) | | | (0.090) | |

Note: In parentheses are p-values based on robust standard errors clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using robust standard errors.

### 4.3.4 Auditor industry expertise, abnormal audit report lag, and future stock price crash risk

Table 6 reports the multivariate results on the association between audit report lag and future stock price crash risk to determine whether different degrees of auditor industry expertise will influence the relationship between audit report lag and stock price crash risk (H3). The coefficients of audit report lag multiplied by auditor industry expertise (*ARL*×*IPS*) in column (1) and column (4) are significantly negative, which means that high auditor industry expertise can weaken the positive impact of abnormal audit report lag on stock price crash risk.

We further divide our samples into two groups—auditors with industry expertise and auditors with no industry expertise—and test how abnormal audit report lag affects future stock price crash risk under different external governance mechanisms. Table 6 reports the test results for hypothesis H3a (H3b). When the dependent variable is *FNCSKEW*, the coefficient of abnormal audit report lag (*ARL*) with auditor industry expertise is negative but not significant, while the coefficient of abnormal audit report lag (*ARL*) without auditor industry expertise is significantly positive at the 1% level. Bootstrap test results show that the difference between the two groups of coefficients is 0.182 (0.119+0.063), and the difference is significant at the 10% level, indicating that the difference between the two groups passed the bootstrap test: that is, if the accounting firm selected by the listed company does not have industry expertise, abnormal audit report lag has a greater impact on future stock price crash risk. This verifies hypothesis H3b. Overall, our findings provide strong support for hypothesis 3b.

The above results show that the positive impact of abnormal audit report lag on stock price crash risk is less pronounced when firms enjoy a higher quality of internal control and when the audit firm has industry expertise. Thus, hypotheses H2b and H3b are verified.

## V. Robustness Tests

In this section, we examine the robustness of the empirical patterns documented in Section IV.

First, we use the dummy variable indicating whether or not a stock price crash occurs as the dependent variable and conduct a logit regression. *Crash* is an indicator variable that equals 1 for a firm-year that experiences one or more crash weeks during the next fiscal year period and 0 otherwise (Jin and Myers, 2006; Kim *et al.*, 2011a, 2011b). The results of the regression test are shown in Table 7. In column (1), abnormal audit time lag (*ARL*) is positively correlated with future stock price crash risk at the 10% level. We also use the logarithm of the days between the fiscal year-end and the date of the audit report as the alternative dependent variable. The results are shown in columns (2), (3), and (4) of Table 7. The coefficient of audit report lag (*Lag*) in columns (2), (3), and (4) of Table 7 is

significantly positive at the 1%, 1%, and 5% levels, respectively, which suggests that audit report lag (*Lag*) is positively correlated with future stock price crash risk (*FNCSKEW*, *FDUVOL*), and the conclusion remains unchanged, which further supports the previous results.

**Table 7 Robustness Test 1**

| Variables | (1) *Fcrash* | (2) *FNCSKEW* | (3) *FDUVOL* | (4) *Fcrash* |
|---|---|---|---|---|
| *ARL* | 0.210* | | | |
| | (0.094) | | | |
| *Lag* | | 0.095*** | 0.087*** | 0.205** |
| | | (0.002) | (0.000) | (0.039) |
| *NCSKEW* | | -0.086*** | | |
| | | (0.000) | | |
| *DUVOL* | | | -0.136*** | |
| | | | (0.000) | |
| *Ret* | 0.246*** | 0.246*** | 0.175*** | 0.247*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Mtb* | 0.019 | -0.009 | -0.018*** | 0.021 |
| | (0.307) | (0.275) | (0.006) | (0.271) |
| *Size* | -0.014 | -0.059** | -0.060*** | -0.015 |
| | (0.732) | (0.015) | (0.001) | (0.715) |
| *Lev* | 0.108 | 0.042 | -0.014 | 0.119 |
| | (0.566) | (0.657) | (0.843) | (0.527) |
| *Cr* | 0.026* | 0.015** | 0.012** | 0.026* |
| | (0.072) | (0.046) | (0.036) | (0.079) |
| *Roa* | -0.016 | -0.342 | -0.590*** | 0.133 |
| | (0.981) | (0.139) | (0.001) | (0.845) |
| *Loss* | 0.037 | 0.039 | 0.030 | 0.028 |
| | (0.760) | (0.309) | (0.304) | (0.815) |
| *Big4* | -0.218 | -0.020 | -0.008 | -0.213 |
| | (0.124) | (0.740) | (0.871) | (0.134) |
| *Lnfee* | -0.006 | 0.068** | 0.026 | -0.012 |
| | (0.928) | (0.048) | (0.303) | (0.852) |
| Constant | -1.560** | -0.213 | 0.839** | -2.389*** |
| | (0.033) | (0.685) | (0.034) | (0.004) |
| Observations | 17,392 | 17,392 | 17,392 | 17,392 |
| Year/Industry | Fixed | Fixed | Fixed | Fixed |
| Pseudo $R^2$ | 0.0575 | 0.0745 | 0.1084 | 0.0577 |
| F/ Log pseudolikelihood | . -5113.82 | 60.69 | 88.04 | . -5113.07 |

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

Second, in Section IV, auditor industry expertise is based on industry portfolio share (*IPS*). In this section, we use accounting firms' industry market share (*IMS*) for robustness testing. The calculation method is as follows:

$$IMS_{i,k} = \sum_{j=1}^{J} REV_{i,k,j} \,/\, \sum_{i=1}^{I} \sum_{j=1}^{J} REV_{i,k,j} \tag{8}$$

The numerator is the total principal business income (*REV*) of clients in industry *k* where accounting affairs (*i*) is located, and the denominator is the total business income of all clients in industry *k*. According to previous studies, when the *IMS* value is greater than or equal to 10%, it is considered that the firm has industry expertise. The test results are shown in Table 8. Columns (1) and (3) show the results for the audit industry expertise group with insignificant coefficients. Columns (2) and (4) present the results for the non-audit expertise group, and the coefficients are significantly positive at the 5% level. This indicates that the positive impact of abnormal audit lag on stock price crash risk is more pronounced in the group without auditor industry expertise.

**Table 8 Robustness Test 2**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | expertise | no expertise | expertise | no expertise |
| Variables | *FNCSKEW* | *FNCSKEW* | *FDUVOL* | *FDUVOL* |
| *ARL* | 0.164 | 0.085** | 0.129 | 0.074** |
| | (0.302) | (0.025) | (0.296) | (0.011) |
| *NCSKEW* | -0.105*** | -0.092*** | | |
| | (0.002) | (0.000) | | |
| *DUVOL* | | | -0.180*** | -0.140*** |
| | | | (0.000) | (0.000) |
| *Ret* | 0.290*** | 0.240*** | 0.168*** | 0.174*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Mtb* | 0.002 | -0.013 | -0.007 | -0.021*** |
| | (0.955) | (0.160) | (0.772) | (0.003) |
| *Size* | -0.014 | -0.061** | -0.013 | -0.057*** |
| | (0.896) | (0.021) | (0.859) | (0.005) |
| *Leverage* | -0.088 | 0.034 | -0.242 | -0.018 |
| | (0.806) | (0.733) | (0.365) | (0.803) |
| *Cr* | 0.039 | 0.015* | 0.037* | 0.010 |
| | (0.133) | (0.074) | (0.051) | (0.108) |
| *Roa* | -0.827 | -0.426* | -0.994* | -0.702*** |
| | (0.344) | (0.081) | (0.091) | (0.000) |
| *Loss* | 0.044 | 0.026 | 0.104 | 0.013 |
| | (0.731) | (0.519) | (0.294) | (0.682) |
| *Big4* | 0.469* | -0.042 | 0.303* | -0.043 |
| | (0.058) | (0.570) | (0.093) | (0.474) |
| *Lnfee* | 0.084 | 0.049 | 0.047 | 0.008 |
| | (0.532) | (0.180) | (0.621) | (0.775) |
| Constant | -1.168 | 0.521 | -0.171 | 1.431*** |
| | (0.574) | (0.359) | (0.904) | (0.001) |
| Observations | 1,851 | 15,541 | 1,851 | 15,541 |
| Year/Industry | Fixed | Fixed | Fixed | Fixed |
| Adj. $R^2$ | 0.0955 | 0.0761 | 0.1236 | 0.1119 |
| F | 9.083 | 54.67 | 10.61 | 81.66 |

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

**Table 9 Robustness Test 3: Abnormal Audit Report Lag, Internal Control, Auditor Industry Expertise, and Future Stock Price Crash Risk** (2SLS; IV is the auditor's customer range in the first stage)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Variables | All | All | High | Low | High | Low | High | Low | High | Low |
| | *FNCSKEW* | *FDUVOL* | *FNCSKEW* | *FNCSKEW* | *FDUVOL* | *FDUVOL* | *FNCSKEW* | *FNCSKEW* | *FDUVOL* | *FDUVOL* |
| *ARL* | 1.857 | 2.023** | 0.037 | 0.074 | 0.043 | 0.066* | -0.803 | 2.176* | -1.617 | 2.362** |
| | (0.105) | (0.032) | (0.429) | (0.164) | (0.230) | (0.097) | (0.858) | (0.073) | (0.698) | (0.021) |
| *NCSKEW* | 0.044*** | | 0.053*** | 0.055*** | | | 0.045 | 0.044*** | | |
| | (0.000) | | (0.000) | (0.000) | | | (0.237) | (0.001) | | |
| *DUVOL* | | -0.004 | | | -0.013 | -0.004 | | | -0.032 | -0.002 |
| | | (0.781) | | | (0.431) | (0.819) | | | (0.614) | (0.885) |
| *Ret* | 0.265*** | 0.200*** | 0.308*** | 0.299*** | 0.232*** | 0.215*** | 0.344*** | 0.252*** | 0.228** | 0.190*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.016) | (0.000) |
| *Mtb* | 0.010* | -0.007 | 0.003 | -0.018** | -0.006 | -0.024*** | 0.057 | 0.006 | 0.014 | -0.010* |
| | (0.090) | (0.185) | (0.769) | (0.040) | (0.448) | (0.000) | (0.138) | (0.375) | (0.687) | (0.058) |
| *Size* | -0.029** | -0.039*** | -0.063*** | -0.068*** | -0.067*** | -0.064*** | -0.009 | -0.033** | -0.046 | -0.042*** |
| | (0.025) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.924) | (0.018) | (0.580) | (0.000) |
| *Leverage* | -0.114* | -0.164*** | -0.161* | 0.081 | -0.176*** | 0.005 | -0.130 | -0.086 | 0.026 | -0.147*** |
| | (0.059) | (0.001) | (0.058) | (0.254) | (0.007) | (0.922) | (0.825) | (0.189) | (0.960) | (0.007) |
| *Cr* | 0.011** | 0.011*** | 0.016*** | 0.013** | 0.011** | 0.012*** | 0.006 | 0.012** | 0.017 | 0.011** |
| | (0.018) | (0.004) | (0.007) | (0.023) | (0.023) | (0.006) | (0.810) | (0.023) | (0.406) | (0.013) |
| *Roa* | -0.138 | -0.410** | 0.079 | -0.221 | -0.196 | -0.501** | -0.308 | -0.172 | -0.540 | -0.453** |
| | (0.538) | (0.024) | (0.813) | (0.427) | (0.436) | (0.015) | (0.735) | (0.474) | (0.491) | (0.023) |
| *Loss* | 0.028 | 0.032 | -0.117 | 0.035 | -0.037 | 0.025 | 0.119 | 0.005 | 0.083 | 0.013 |
| | (0.491) | (0.316) | (0.371) | (0.416) | (0.744) | (0.439) | (0.442) | (0.904) | (0.540) | (0.705) |
| *Big4* | 0.007 | -0.019 | 0.026 | 0.019 | 0.020 | 0.029 | 0.125 | -0.004 | 0.051 | -0.027 |
| | (0.861) | (0.541) | (0.559) | (0.798) | (0.552) | (0.609) | (0.533) | (0.926) | (0.777) | (0.405) |
| *Lnfee* | -0.027 | -0.001 | -0.031 | -0.049* | -0.016 | -0.044** | -0.050 | -0.019 | 0.016 | 0.003 |
| | (0.202) | (0.938) | (0.191) | (0.092) | (0.388) | (0.041) | (0.638) | (0.396) | (0.866) | (0.869) |
| Constant | 0.832*** | 1.214*** | 1.621*** | 1.769*** | 1.932*** | 2.026*** | 0.270 | 0.816*** | 0.312 | 1.233*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.857) | (0.000) | (0.815) | (0.000) |
| Observations | 17,392 | 17,392 | 8,768 | 8,624 | 8,768 | 8,624 | 2,036 | 15,356 | 2,036 | 15,356 |
| MSE | 1.0433 | 0.84561 | 0.95104 | 0.96642 | 0.72035 | 0.7163 | 0.94645 | 1.071 | 0.82237 | 0.8833 |

Note: Table 9 presents the results with p-values (in parentheses) based on robust standard errors clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, using robust standard errors. The results of the first-stage regression show that the coefficient of the auditor's customer range is significant. So, the correlation conditions of the instrument variables can be satisfied. Besides, the Cragg Donald Wald F statistics obtained by 2SLS are all greater than 10, which indicates that there is no risk of weak instrumental variables.

Third, to address the potential endogeneity[4] of abnormal audit report lag (*ARL*) and stock price crash risk (*FNCSKEW* or *FDUVOL*), we select auditor's customer range (excluding company *i*, the natural logarithm of the number of all clients of the auditor in

[4] Firms' stock price crash risk is relatively high or serious problems exist in the financial report, and the auditor needs to spend more time and effort digging out more customer misinformation, thereby reducing the possibility that the management tries to hide bad news.

year *t* plus 1) as an instrumental variable for audit report lag. Auditor's customer range is an appropriate instrumental variable for two reasons. First, the total number of clients an auditor has (excluding firm *i*) will affect the auditor's audit input to a firm: the greater the number of clients an auditor has (excluding firm *i*), the less the audit input to firm *i*. Second, the auditor's customer range has no direct effect on a firm's stock price crash risk.

**Table 10 Robustness Test 4: The PSM Results**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Variables | *FNCSKEW* | *FDUVOL* | *FNCSKEW* | *FDUVOL* |
| *ARL* | 0.090** | 0.082** | | |
| | (0.035) | (0.013) | | |
| *Lag* | | | 0.098*** | 0.093*** |
| | | | (0.008) | (0.001) |
| *NCSKEW* | -0.094*** | | -0.094*** | |
| | (0.000) | | (0.000) | |
| *DUVOL* | | -0.141*** | | -0.142*** |
| | | (0.000) | | (0.000) |
| *Ret* | 0.230*** | 0.165*** | 0.230*** | 0.165*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Mtb* | 0.001 | -0.013* | 0.002 | -0.012 |
| | (0.895) | (0.080) | (0.810) | (0.107) |
| *Size* | -0.027 | -0.039* | -0.029 | -0.041** |
| | (0.313) | (0.054) | (0.275) | (0.042) |
| *Lev* | 0.047 | 0.008 | 0.052 | 0.013 |
| | (0.655) | (0.918) | (0.622) | (0.869) |
| *Cr* | 0.014* | 0.012* | 0.014* | 0.012* |
| | (0.085) | (0.062) | (0.088) | (0.065) |
| *Roa* | -0.396 | -0.575*** | -0.331 | -0.514*** |
| | (0.129) | (0.004) | (0.206) | (0.009) |
| *Loss* | 0.057 | 0.046 | 0.053 | 0.042 |
| | (0.174) | (0.148) | (0.205) | (0.184) |
| *Big4* | -0.053 | -0.040 | -0.054 | -0.042 |
| | (0.428) | (0.432) | (0.416) | (0.418) |
| *Lnfee* | 0.078** | 0.029 | 0.076** | 0.027 |
| | (0.037) | (0.294) | (0.044) | (0.335) |
| Constant | -0.615 | 0.733* | -0.969* | 0.397 |
| | (0.273) | (0.080) | (0.092) | (0.356) |
| Observations | 14,304 | 14,304 | 14,304 | 14,304 |
| Year/Industry | Fixed | Fixed | Fixed | Fixed |
| Adj. $R^2$ | 0.0733 | 0.1069 | 0.0735 | 0.1073 |
| F | 46.75 | 68.92 | 46.99 | 69.26 |

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

Table 9 reports the results for hypothesis H1a (H1b) in columns 1 and 2, hypothesis H2a (H2b) in columns 3 to 6, and hypothesis H3a (H3b) in columns 7 to 10 using the two-stage least squares (2SLS) method. The results in columns (2), (6), (8), and (10) of Table 9 show that the coefficient of audit report lag (*Lag*) is significantly positive at the 5%,

10%, 10%, and 5% levels, respectively, which suggests that audit report lag (*Lag*) is positively correlated with future stock price crash risk (*FNCSKEW*, *FDUVOL*) and that abnormal audit report lag has a greater and more significant impact on the stock price crash risk of companies with lower internal control quality and when the auditor has industry expertise. The conclusion remains unchanged, which further supports the previous results.

Finally, considering the possible endogeneity of the model, we also use the propensity score matching (PSM) method for further testing. We match the treatment group (the group with abnormal audit time lag greater than 0) with the control group (the group with abnormal audit time lag less than or equal to 0) and reconstruct the regression test on the matched samples, and a total of 14,304 samples are obtained after successful matching. Table 10 shows that abnormal audit time lag (*ARL*) and audit lag days (*Lag*) are positively correlated with future stock price crash risk at least at the 5% level, which means that all the conclusions still hold after controlling for possible endogeneity.

## VI. Conclusion

The auditor, as the information intermediary of the capital market, is an important channel for investors to obtain reliable annual report information on listed companies and plays an irreplaceable role in economic development. However, our study shows that an extended audit time does not bring about an improvement in accounting information quality and that in the case of listed companies, the time lag of an abnormal audit is a dominant signal of a stock price crash. Specifically, our study reaches two conclusions. First, the abnormal audit report lag of listed companies is significantly positively related to future stock price crash risk: that is, in the case of listed companies, the audit delay can be used as a pre-warning signal of a stock price crash. Second, the warning role of abnormal audit report lag is affected by the internal governance mechanism and the external governance mechanism, respectively. In particular, the relationship between abnormal audit report lag and future stock price crash risk will be weakened when the internal control level of listed companies is strong or the audit firms have professional expertise. This shows that a good internal and external information environment has a certain supervisory and governance role and can inhibit management's motivation to use bad financial reports to hide bad news.

Our paper estimates the abnormal audit report lag of companies by constructing a model based on controlling the fundamental changes of listed companies. Starting with the new perspective of the audit function, we focus on the economic consequences of abnormal audit report lag and discuss its impact on future stock price crash risk. The results enrich two aspects of the factors affecting listed companies' future stock price crash risk and the economic consequences of audit report lag. Last but not least, our paper reveals the relationship between audit report lag and future stock price crash risk and reminds stakeholders to supervise and pay attention to the signal of abnormal audit report lag, which

is helpful to protect the wealth of investors, maintain the stability of the capital market, and promote healthy economic development.



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## Appendix A: Variable Definitions

| Variable Symbol | Variable Name | Definition |
|---|---|---|
| *FNCSKEW* | Risk of future stock price crash | The negative skewness of firm-specific weekly returns over the fiscal year period in year $t$+1, calculated by model (4) |
| *FDUVOL* | Risk of future stock price crash | The log of the ratio of the standard deviation of firm-specific weekly returns for down weeks to the standard deviation of firm-specific weekly returns for up weeks in year $t$+1, calculated by model (5) |
| *ARL* | Abnormal audit report lag | Calculated by model (2) |
| *NCSKEW* | Risk of a stock crash that year | Year $t$ negative skewing coefficient of stock return , calculated by model (4) |
| *DUVOL* | Risk of a stock crash that year | Year $t$ stock yield fluctuation ratio, calculated by model (5) |
| *Ret* | Annual average weekly return on stocks | The mean of firm-specific weekly returns over the fiscal year period in year $t$ |
| *Mtb* | Market-to-book ratio | The market value of equity divided by the book value of equity |
| *Size* | Company size | Take the logarithm of total assets |
| *Leverage* | Asset-liability ratio | Total liabilities / total assets |
| *Cr* | Current ratio | Current assets / current liabilities |
| *Roa* | Return on assets | The ratio of net profit of stock $i$ to total assets in year $t$ |
| *Loss* | Loss or not | Equals 1 if the net profit is less than 1 and 0 otherwise |
| *Big4* | Audited by Big Four auditors or not | Equals 1 if the firm employs a Big Four auditor and 0 otherwise |
| *Lnfee* | Audit fee | Take the logarithm of the audit fee |