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Internal Control and Stock Price Crash Risk: Evidence from China

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Internal Control and Stock Price Crash Risk: Evidence from China

Abstract

This paper examines the role played by internal control and its five components (i.e., control environment, risk assessment, control activities, information and communication, and monitoring) in alleviating future stock price crash risk. Using a unique dataset from China, we find evidence that internal control is negatively associated with future stock price crash risk. Specifically, control environment and monitoring are significantly and negatively associated with future stock price crash risk. Moreover, the negative association between internal control and crash risk is significantly more pronounced in firms with weak internal and external governance (i.e., audited by non-Big 4 auditors, located in provinces with low market development, and less conservative in accounting) and with poor ability to mitigate impacts of extreme negative events (i.e., non-state-owned enterprises). Our study highlights the delicate role of internal control as a mechanism in preventing crash of stock price.

JEL classifications: G32; M41

Keywords: Internal Control; Stock Price Crash Risk; China Studies

Data availability: The data are available from the public sources identified in this paper.

Internal Control and Stock Price Crash Risk: Evidence from China

1. Introduction

Corporate scandals and auditing failures, such as those of Enron, Tyco, and WorldCom, have motivated regulators to address the effectiveness of internal corporate controls. For example, Section 404 of the Sarbanes–Oxley Act (SOX 404) requires public U.S. companies to disclose information on internal controls. Numerous studies examine how internal control weakness (ICW) is associated with the first and second moments of return distribution (i.e., average return, cost of capital, idiosyncratic risk, or systematic risk).[1] Few studies examine how internal control affects stock price crash risk (hereafter, crash risk), which is regarded as the third moment of stock returns. Crash risk is a large negative market-adjusted stock returns (Hutton et al., 2009; Jin and Myers, 2006) and is an undesirable characteristic of a firm for investors. More importantly, we know little about how the five components of internal control proposed by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) affect crash risk. This study investigates these important and unexplored research issues.

We investigate whether firms with better internal control mechanisms are less prone to price crash. According to COSO, internal control has five components, namely, control environment, risk assessment, control activities, information and communication, and monitoring. Prior studies document that control environment and information and communication reduce earnings management and enhance the quality of corporate disclosure (Chen, Dong, Han, and Zhou 2013). Therefore, the control environment as well as information and communication can limit the ability of corporate insiders to withhold bad news, which lowers crash risk. Moreover, risk assessment helps managers evaluate risk accurately, thus preventing them from taking extreme risk, which leads to lower crash risk. Control activities help ensure that necessary actions are taken to address risks that may hinder firms from achieving their objectives. Such events eventually help reduce the probability of an extreme negative event, which is one of the most

[1] For example, Ogneva, Subramanyam, and Raghunandan (2007), Hammersley, Myers and Shakespeare (2008), and Beneish, Billings and Hodder (2008).

important triggers of price crash. Finally, monitoring means assessing the performance of the internal control system over time to ensure that the system functions well. Thus, monitoring strengthens the effects of the other four components of internal control on crash risk. In summary, we predict that internal control and its five components reduce crash risk.

Our measure of internal control is the internal control index developed by China's Xiamen University. This index has been published annually in the three most influential financial newspapers in China: *China Securities Journal*, *Shanghai Securities News*, and *Securities Times*. The index is widely used and cited by media, auditors, listed companies, and scholars in China.[2] The internal control index is constructed by tracking the internal control information of a firm using financial statements, China Securities Regulatory Commission (CSRC) filings, government documents, and press releases. The index covers fully 99% of all of Chinese public firms from 2007 to 2010. More important, this index is further decomposed into the five sub-indexes of control environment, risk assessment, control activities, information and communication, and monitoring, thus enabling us to evaluate the strength of the five dimensions of internal control. Crash risk is proxied by the probability of extreme, negative firm-specific returns and the negative skewness of firm-specific returns (Chen, Hong, and Stein, 2001 and Kim, Li and Zhang, 2011a). We use a sample of Chinese firms listed on the Shanghai and Shenzhen stock exchanges from 2007 to 2010 to conduct our analysis.

Our findings suggest that internal control is significantly and negatively related to crash risk. Moreover, we document that the control environment component is negatively correlated with our two crash risk measures. Monitoring and information and communication components are significantly and negatively associated with one of the two crash risk measures. Risk assessment and control activities components are not significant with respect to any crash risk measures. That is, not every component of internal control has equal impact on the crash risk of a firm.

[2] For example, the corporate governance center of Deloitte cites the internal control index on its website (see: http://www.corpgov.deloitte.com/site/chinazh/; accessed on May 24, 2015).

In addition, we investigate whether the negative association between internal control and crash risk is affected by internal and external monitoring, the ability to limit bad news hoarding, and the ability to mitigate the effects of extreme negative events. We find that the negative association between internal control and crash risk is significant (insignificant) when firms have weak (strong) internal and external governance (i.e., when audited by non-Big Four auditors or located in a province with low market development, respectively), weak (strong) ability to limit bad news hoarding (i.e., with less accounting conservatism), or weak (strong) ability to mitigate the effects of extreme negative events (i.e., non-state-owned enterprises (non-SOEs)). These results are consistent with the notion that the role of internal control in lowering crash risk is particularly important when internal monitoring by an auditor or external monitoring by the market is weak, when firms' ability to limit bad news hoarding is weak, or when firms' ability to mitigate the effect of extreme negative events is poor (i.e., non-SOEs). The results address a potential concern that the negative association between internal control and crash risk may be the outcome of corporate governance. We find that the negative association between internal control and crash risk exists only in firms with weak governance (i.e., low auditing quality and weak market development). Thus, the negative association between internal control and crash risk is not driven by firms with both good internal control and good corporate governance. Overall, this study supports the view that internal control limits the ability of managers to conceal bad news and helps reduce the probability of extreme negative events, which lower crash risk.

This study contributes to the literature in several ways. First, to the best of our knowledge, this is the first study to examine the third moment effects on internal control and its five components. We offer evidence that internal control and some of the five components are important determinants of crash risk. More importantly, the study reveals that control environment, monitoring, and information and communication are the three important components of internal control in reducing crash risk. This finding is particularly important because investors pay attention to the probability of extreme outcomes (Pan, 2002). Second, SOX 404 requires public U.S. companies to disclose information on internal controls and get their internal controls evaluated by their auditors. However, U.S. studies provide mixed results on the relation between ICW and crash risk. Zhou, Kim, and Yeung (2014) document that firms with ICW are more prone to crash than those without ICW. In contrast, Kim and Zhang (2014) find that ICW does not predict realized crash risk. Our study finds that internal controls help reduce crash risk, generating additional empirical evidence to support the regulation[3]. Third, our study documents that internal and external monitoring mechanisms, a firm's ability to limit bad news hoarding, and its ability to assuage the effects of extreme negative events influence the association between internal control quality and crash risk. This finding suggests that internal control can function well in reducing crash risk when strong internal and external monitoring are unavailable, when firm ability to limit bad news hoarding is weak, and when firms poorly mitigate the effects of extreme negative events. Finally, our study provides an important policy implication to securities market regulators. Our results suggest that internal control, especially its control environment, monitoring, and information and communication elements, plays an important role in determining crash risk and/or maintaining stability in the capital markets.

The remainder of this paper proceeds as follows. Section 2 reviews the literature and develops the research hypotheses. Section 3 describes the sample selection and specifies the research design. Section 4 describes the data and presents descriptive statistics and empirical results. Finally, Section 5 concludes.

2. Literature Review and Hypothesis Development

This study relates to two streams of the literature: (1) research that examines the determinants of crash risk, and (2) research that investigates the economic consequences of internal control. We briefly review these two streams and subsequently develop our research hypotheses.

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[3] We conjecture that there at least three reasons that could lead to different findings from Kim and Zhang (2014). First, the proxy of internal control quality in the two US studies is a dummy variable, while ours is a continuous variable which could lead to more powerful tests. Second, our data comes from China, an emerging market with weaker legal institutions, poorer corporate governance environment, and less experience in risk management compared with the U.S. Thus, the marginal effects of internal control quality on crash risk might be greater in China, which makes us easier to detect the effects of internal control on crash risk. Third, as pointed out by Kim and Zhang (2014; p. 856): "In untabulated tests, we find that ICW does not predict future realized crashes. This does not necessarily mean that ICW does not increase future crash risk; it may simply be that internal control-driven crashes have not materialized yet. More importantly, it does not mean that ICW does not increase investors' fear of future crash risk." Therefore, it's possible that internal control-driven crashes exist in both the U.S. and China.

2.1 Determinants of crash risk

The risk of stock price crash is the probability of extreme negative stock returns for a specific period, normally one year (Jin and Myers, 2006; Kim, Li and Zhang, 2011a, b). Securities regulators and investors have been paying attention to research on crash risk since several corporate frauds occurred in the early 2000s. This topic became even more important after the financial crisis of 2008, thus driving several researchers to investigate the determinants of crash risk.

Jin and Myers (2006) build a model in which outsiders have limited information to analyze the behavior of managers withholding bad news, which leads to stock price crash. At the end of the fiscal year, managers must pay sufficient dividends to meet the expectations of investors, or they may face termination. If a company performs poorly, managers may withhold this bad news until the dividend payment meets the expectations of investors. However, when bad news accumulates beyond a threshold, managers give up withholding it, and all the bad news is released. Such an event leads to stock price crash and extreme values on the left of the stock return distribution. Consistent with their prediction, Jin and Myers (2006) find that bad news is less likely to be withheld in a country with higher information transparency, which lowers crash risk.

Consistent with Jin and Myers (2006), Hutton, Marcus and Tehranian (2009) document a negative association between corporate transparency and crash risk at the firm level. Their findings indicate that the association between information transparency and crash risk disappeared after SOX was implemented in 2002, because of strong monitoring. Building on prior theoretical and empirical research, several researchers have begun to study the firm-level determinants of crash risk, such as tax avoidance, CEO/CFO compensation, accounting conservatism, and institutional investors (Kim, Li and Zhang, 2011a, b; Callen and Fang, 2013; Kim and Zhang, 2015). Kim, Li and Zhang (2011b) find that tax avoidance facilitates managers' misbehavior that lead to higher future crash risk, such as rent seeking and withholding bad news. Moreover, these authors document that external monitoring mechanisms, such as analyst following and institutional investors, help restrain the behavior of managers, thus decreasing crash risk. Kim, Li and Zhang (2011a) expect that equity compensation motivates managers to withhold bad news, which leads to higher crash risk. Kim and Zhang (2015) report that accounting conservatism, that is, setting a higher degree of verification to recognize good news as gains rather than to recognize bad news as losses, can lower crash risk. Callen and Fang (2013) show that institutional investors provide monitoring, lowering firm crash risk. To illustrate bad news hoarding and crash risk of a firm, we present two separate cases in China in Appendix A. The first case is Chongqing Brewer, whose stock price dropped more than 40% over the period December 9 to December 14, 2011, after a report surfaced on its illegal transfer of shares of its subsidiary to two scientists in December 2005. The second case is Yili Group (a dairy product company), whose stock price fell sharply and hit an all-time low on September 17, 2008 after news reports that suppliers of milk had been adding a toxic chemical so as to disguise dilution of milk. Some believe that executives of Yili Group were aware of the practice of adding the toxic chemical before the news broke; several of these executives received jail time. Both cases suggest that when hidden bad news is eventually revealed to the public, stock price crashes. For Chongqing Brewer, the unveiling of bad news is endogenous, while in Yili Group, the source of bad news is exogenous.

Such empirical and anecdotal evidence supports the view that hiding bad news eventually triggers stock price crash. To our best knowledge, no prior research investigates the effect of internal control components as an important mechanism in preventing the bad news withholding behavior of managers in relation to crash risk.

2.2 Economic consequences of internal control

Several previous studies investigate the economic consequences of internal control by exploiting SOX 404 disclosure as a research setting. Specifically, several studies document that firms with ICW are charged a higher cost of equity (Ogneva, Subramanyam and Raghunandan, 2007; Ashbaugh-Skaife et al., 2009), public debt (Dhaliwal et al., 2011), and private debt (Kim, Song and Zhang, 2011) than those without ICW. Kim, Yeung and Zhou (2014) examine the effect of ICW on crash risk and document that firms with ICW are more prone to crash than those without ICW.

The ICW literature primarily focuses on whether a firm has ICW or not. That is, ICW is a dummy variable. The findings from the literature are for firms with or without ICW. Therefore, the internal control measure used by prior literature is only a crude one. It is not clear about the impact of internal control magnitude on a specific issue. Our study uses a unique database on a continuous measure of internal control to investigate directly the association between the magnitude of internal control and crash risk. In addition, most studies on internal control have been conducted in the U.S. Thus, the generalizability of their conclusions to other countries, especially emerging economies, remains unknown. Our study focuses on China, where internal control may play an important role because strong internal and external monitoring mechanisms are scarce. Moreover, prior studies do not provide evidence on how the five components of internal control identified by COSO relate to crash risk. We use a unique database to measure the five components of internal control to investigate the effects of these components on crash risk.

2.3 Hypothesis development

The above discussion indicates that internal control is a mechanism that reduces information asymmetry and increases information transparency. Internal control reasonably ensures the effectiveness and efficiency of business, reliability of financial reporting, and compliance with laws and regulations (COSO, 1992). COSO identifies five components of internal control. The internal control system and its five components may restrain crash risk because they conceptually reduce the likelihood of executives hiding bad news. We analyze the effects of these five components on crash risk.

The control environment is the overall attitude, awareness, and actions of directors and managers regarding the internal control system and its importance to the entity. The control environment sets the tone of an organization and influences the control consciousness of people in the organization. The control environment can be reflected in internal control processes and requirements, ethical values, corporate culture, philosophy, operating style, organizational structure, and human resources policies and procedures. The control environment is the foundation for the remaining four components of internal control, because it provides discipline, principles, and structure for the organization. Thus, a good control environment helps prevent bad news hoarding.

Information and communication disclose operational, financial, and compliance-related information, which is important to running and controlling the business. Information and communication address not only communication within the organization, but also with outsiders, such as customers, suppliers, regulators, and shareholders. Prior studies document that the control environment and information and communication can reduce earnings management and increase the quality of corporate disclosure (Chen et al., 2013). Therefore, the control environment and information and communication can prevent insiders from withholding bad news, leading to lower crash risk.

Risk assessment identifies and analyzes the relevant risks of achieving the firm's objectives, which form a basis for risk management. Firms suffering from macro-level, industry-level, and firm-specific risks should identify and manage potential and existing risks. Risk assessment helps companies control the risks they take and avoid extreme risk-taking behavior. Accordingly, risk assessment can lead to lower crash risk.

Control activities help ensure that corporate policies are enforced. Control activities exist throughout the organization at all levels and in all functions. Control activities are varied, including approvals, authorizations, verifications, reconciliations, reviews of operating performance, security of assets, and segregation of duties. Thus, we expect that control activities will reduce the probability of an extreme event, which is one of the most important triggers of stock price crash.

Monitoring assesses the performance of internal control systems through ongoing surveillance activities, separate evaluations, or a combination of the two. Ongoing monitoring occurs in the course of operations and includes regular management, supervisory activities, and other actions. Internal control deficiencies are reported upstream through monitoring. Serious issues are reported to top managers and the corporate board. Monitoring ensures the function of the other four components of internal control and informs managers of internal control deficiencies, allowing them to take action to correct them in time.

Among the five components of internal control, control environment, monitoring, information and communication are more macro-level, direct, and presumably have more direct impact on a firm's internal control; thus, we expect them to be more relevant in controlling bad news withholding. Risk assessment and control activities, while still important in internal control, relate to more micro-level and piece-wide components of internal control. Therefore, these activities may or may not be relevant in curtailing executive hoarding of bad news. Overall, we expect that internal control can mitigate crash risk through controlling bad news withholding activities, but different components of internal control may differ in strength of mitigating bad news withholding, and thus crash risk. Based on the above discussion, we propose the following hypotheses:

H1: The quality of internal control is negatively associated with crash risk, ceteris paribus.

H1a: The quality of control environment is negatively associated with crash risk, ceteris paribus.

H1b: The quality of information and communication is negatively associated with crash risk, ceteris paribus.

H1c: The quality of risk assessment is negatively associated with crash risk, ceteris paribus.

H1d: The quality of control activities is negatively associated with crash risk, ceteris paribus.

H1e: The quality of monitoring is negatively associated with crash risk, ceteris paribus.

3. Sample Selection and Research Design

3.1 Sample data

Our sample consists of all publically traded Chinese firms listed on the Shanghai and Shenzhen stock exchanges from 2007 to 2010. We obtain all financial and stock market data from the China Stock Market and Accounting Research (CSMAR) database. The internal control data are obtained from the internal control index database developed by the internal control research center of Xiamen University (Chen et al., 2013). Panel A of Table 1 shows that we exclude: (1) 204 observations from the financial industry, (2) 124 observations that lack internal control data, and (3) 2,115 observations without data for control variables. Our final sample contains 8,495 firm-year observations.

Panel B of Table 1 presents the distribution of our final sample by industry. Table 1 shows that 59.33% of our sample is clustered in the manufacturing industry, and only 0.40% of our sample is from the media and cultural industry. The distribution of our final sample by industry is similar to that in the CSMAR database, which indicates that our sample is unbiased. Panel C of Table 1 shows the distribution of our sample by year. Sample size increases steadily because of the expansion of Chinese capital markets during the sample period.

[Insert Table 1 Here]

3.2 Research model design

3.2.1 Internal control measure

We use the Chinese Internal Control Index, denoted by *IC_INDEX*, to measure the quality of internal control. The index[4] is constructed by the Internal Control Research Center of Xiamen University. All firms listed on the Shanghai Stock Exchange and on the Main Section of the Shenzhen Stock Exchange are included. The final index covers 99% of all Chinese public firms from 2007 to 2010, with the other 1% missing necessary internal control information. The final index is constructed by tracking firms' internal control information from financial statements, government documents, and press releases. We explain construction of the index in Appendix C.

Chen et al. (2013) validate the internal control index by confirming the known relation between internal control quality and earnings management. They document a negative association between internal control quality and earnings management. In addition, this index is published annually in the three most influential financial newspapers in Mainland China: *China Securities Journal*, *Shanghai Securities News*,

[4] Introduction of the internal control index can also be seen in the *Internal Control Index (2009) for China's Listed Companies: Formulation, Analysis and Evaluation* as published in *China Securities Journal* and *Shanghai Securities News* and *Establishing the Internal Control Evaluation System Meeting the Actual Situation in China* as published in *Securities Times* both on June 11, 2010 and *Internal Control Index (2010) for China's Listed Companies: Formulation, Analysis and Evaluation* published on September 6, 2011.

and *Securities Times*, and is widely used or cited by media, auditors, listed companies, and scholars in China. The values of *IC_INDEX* range from 0 to 1. A higher value of *IC_INDEX* corresponds to higher quality of internal control. The index comprehensively reflects the level of internal firm control. *IC_INDEX* is further separated into five components, namely, control environment (*CtrEnv*), risk assessment (*Risk*), control activities (*CtrAct*), information and communication (*InfoCom*), and monitoring (*Monitor*). The five sub-indexes describe the quality of the five components of internal control, with values ranging from 0 to 1. Similar to the *IC_INDEX*, a high value of a sub-index means better performance in the specific component.

3.2.2 Measures of crash risk

We use two measures of crash risk based on Chen, Hong and Stein (2001) and Kim, Li and Zhang (2011a,b). We first estimate firm-specific weekly return by regressing the following augmented market model for each firm in each year:

$$\mathrm{r}_{\mathrm{i},\tau} = \alpha_{\mathrm{i}} + \beta_{1,\mathrm{i}}\mathrm{r}_{\mathrm{m},\tau\text{-}2} + \beta_{2,\mathrm{i}}\mathrm{r}_{\mathrm{m},\tau\text{-}1} + \beta_{3,\mathrm{i}}\mathrm{r}_{\mathrm{m},\tau} + \beta_{4,\mathrm{i}}\mathrm{r}_{\mathrm{m},\tau+1} + \beta_{5,\mathrm{i}}\mathrm{r}_{\mathrm{m},\tau+2} + \varepsilon_{i,\tau} \tag{1}$$

where $\mathrm{r}_{\mathrm{i},\tau}$ is return on firm i in week τ and $\mathrm{r}_{\mathrm{m},\tau}$ is return on the CSMAR value-weighted market index over week τ. We include the lead and lag returns of the market index to allow for nonsynchronous trading (Dimson, 1979). The residual from Equation (1) captures firm-specific weekly return. We log-transform these highly skewed residuals to obtain firm-specific weekly return, $W_{i,\tau}$, which is the natural log of 1 plus the residual return from Equation (1).

The first measure of crash risk is denoted by *CRASH*, which is equal to 1 if a firm experiences one or more firm-specific weekly returns (i.e., $W_{i,\tau}$) falling under 3.2 standard deviations below the mean firm-specific weekly returns for that fiscal year. This measure captures the probability of detecting extremely negative firm-specific weekly returns in a fiscal year.

Our second measure of crash risk, *NCSKEW*, is the negative of the third moment of firm-specific weekly returns. We calculate *NCSKEW* by taking the negative of the third moment of returns and dividing it by the standard deviation of returns raised to the third power. That is, for any firm i, in year t,

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

where n is the number of observations of firm i–specific weekly returns during year t.

3.2.3 Main model

Our hypotheses focus on the effect of internal control on crash risk. We estimate the following model to test our hypotheses:

$$PROXY\_CRASH=\beta_0+\beta_1 IC\_INDEX+\beta_2 DTURN_{t-1}+\beta_3 NCSKEW_{t-1}+\beta_4 SIGMA_{t-1}$$
$$+\beta_5 RET_{t-1}+\beta_6 SIZE_{t-1}+\beta_7 MB_{t-1}+\beta_8 LEV_{t-1}+\beta_9 ROA_{t-1}+\beta_{10} ACCM_{t-1}+\beta_{11} Zmijewski_{t-1}$$
$$+Industry + year + \xi_t \tag{3}$$

where *PROXY_CRASH* is $CRASH_t$ and $NCSKEW_t$, respectively. $CRASH_t$ is a dummy variable indicating whether there is a crash of stock price in a specific fiscal year for the firm. $NCSKEW_t$ is the negative coefficient of skewness. IC_INDEX_t is the Chinese Internal Control Index. Based on prior research, we control for several firm characteristics that affect the risk of price crash. $DTURN_{t-1}$ is the difference between average monthly share turnover over the fiscal year and that over the previous fiscal year. This variable reflects investor heterogeneity and is expected to be positively associated with crash risk (Chen, Hong and Stein, 2001; Kim, Li and Zhang, 2011a, b). $NCSKEW_{t-1}$ is lagged $NCSKEW_t$ and is documented to be positively correlated with crash risk. $SIGMA_{t-1}$ is the standard deviation of firm-specific weekly returns over fiscal year t-1, which is a proxy for prior stock return volatility. An increase in volatility is associated with an increase in one-year-ahead crash risk (Chen, Hong and Stein, 2001; Kim, Li and Zhang, 2011a). RET_{t-1} is the mean of firm-specific weekly returns over year t-1, times 100. Firms with high past returns are more prone to price crash in the current year (Chen, Hong and Stein, 2001; Kim, Li and Zhang, 2011a). Finally, studies document that crash risk is correlated with firm size ($SIZE_{t-1}$), market-to-book ratio (MB_{t-1}), return on assets (ROA_{t-1}), leverage (LEV_{t-1}), information opaqueness ($ACCM_{t-1}$), and bankruptcy risk (Zmijewski's risk score $Zmijewski_{t-1}$). Accordingly, we include these variables as controls in our model. In addition, we control industry and year fixed effects. H1 predicts that crash risk decreases with the quality of internal control. Thus, we expect β_1 to be negative.

We construct the following regression model to test further the effects of the five components of internal control on crash risk:

$$PROXY\_CRASH = \gamma_0 + \gamma_1 CtrEnv_t + \gamma_2 RISK_t + \gamma_3 CtrAct_t + \gamma_4 InfoCom_t + \gamma_5 MONITOR_t$$
$$+ \gamma_6 DTURN_{t-1} + \gamma_7 NCSKEW_{t-1} + \gamma_8 SIGMA_{t-1} + \gamma_9 RET_{t-1} + \gamma_{10} SIZE_{t-1} + \gamma_{11} MB_{t-1} + \gamma_{12} LEV_{t-1}$$
$$+ \gamma_{13} ROA_{t-1} + \gamma_{14} ACCM_{t-1} + \gamma_{15} Zmijewski_{t-1} + Industry + year + \xi_t \quad (4)$$

Industry and year fixed effects are also controlled in this model. Our hypotheses (H1a to H1e) predict that crash risk decreases with the quality of the five components of internal control. Thus, we expect γ_1, γ_2, γ_3, γ_4, and γ_5 to be negative.

4. Empirical Results

4.1 Descriptive statistics

Table 2 shows the descriptive statistics and the correlation table for variables used to test our main hypotheses. In Panel A, the mean values of the crash measures $CRASH_t$ and $NCSKEW_t$ are 0.097 and -0.199, respectively. Similar to Chen et al. (2013), the mean *IC_INDEX* is 0.387. Therefore, our sample firms receive only 38.7% of the maximum possible scores. The distribution of *IC_INDEX* is not skewed, because the mean value is almost the same as the median value. The mean (median) value for *CtrEnv* is 0.348 (0.331), consistent with the finding of Chen et al. (2013). The mean (median) value for *RISK* is only 0.198 (0.181). Hence, Chinese listed firms are weak at risk assessment. The mean values for *CtrAct* (0.546) and *InfoCom* (0.495) are higher than those of the other three components. The mean (median) value for *MONITOR* is only 0.344 (0.334), which suggests that monitoring mechanisms in

Chinese listed firms are ineffective. The average change in monthly trading volume (*DTURN*) is -0.071. The average firm in our sample has a weekly return volatility of 0.054, a firm-specific weekly return of -0.160%, a leverage of 0.510, a market-to-book ratio of 3.770, and a return on assets of 0.059. The mean absolute value of abnormal accruals is 0.226.

[Insert Table 2 Here]

Panel B of Table 2 shows the Pearson correlation matrix for all variables, which is used to test the hypotheses. Our measures of the risk of price crash, namely, $CRASH_t$ and $NCSKEW_t$, are significantly and positively correlated with one another. The correlation coefficient between IC_INDEX_t and the measures of crash risk (i.e., $CRASH_t$ and $NCSKEW_t$) are all significantly negative. This finding supports H1, indicating that future crash risk decreases with the quality of internal control. In addition, both proxies for crash risk are significantly and positively correlated with $DTURN_{t-1}$ and MB_{t-1}.

4.2 Hypothesis tests

4.2.1 Effects of internal control on crash risk

Our central hypothesis predicts that companies with better internal control have lower crash risk. Table 3 presents the results of hypothesis testing. The *IC_INDEX* coefficients are uniformly negative and significant at 5% or 1% in each of the models, which strongly supports the main hypothesis. Our results remain qualitatively unchanged when different measures of crash risk are used, as suggested in prior research. The negative *IC_INDEX* coefficient means that crash risk is lower when internal control is stronger. Moreover, our results indicate the economic significance of the effects of internal control on crash risk. For example, based on the coefficients in the second regression in Table 3, it is estimated that when internal control quality increases from the first to the third quartile, the crash risk proxy *NCSKEW* decreases by 0.034, which is 19.73% of the median value of *NCSKEW*. Overall, this result suggests that companies suffer less price crash when they are equipped with a stronger internal control system.

The results for the control variables are consistent with expectations and generally consistent with the results of prior research. For example, the positive coefficients on lagged return (RET_{t-1}) and lagged market-to-book ratio (MB_{t-1}) in Column (1) and Column (2) are consistent with prior studies on crash risk (Chen, Hong and Stein, 2001; Kim, Li and Zhang, 2011a, b; Zhou, Kim, and Yeung, 2014).

[Insert Table 3 Here]

4.2.2 Effects of the five components of internal control on crash risk

We further examine the effects of the five components of internal control on crash risk. Table 4 presents the results of the tests. The coefficients of *CtrEnv* are negative and significant at the 5% or 1% levels in Panels A and B. Thus, the control environment helps reduce crash risk. The *InfoCom* variable is negative and significant at the 5% level in both Columns (4) and (6) in Panel A. For the *Monitor* variable, we find the coefficient negative and significant at the 1% level in both Columns (5) and (6) in Panel B. We do not find significantly negative results associated with the *RISK* and *CtrAct* variables in either panel. Our findings indicate that control environment, information and communication, and monitoring components significantly reduce crash risk. In contrast, risk assessment and control activity components do not show a relation to crash risk. Overall, among the five components of internal control, control environment, monitoring, information and communication are more relevant, while risk assessment and control activity components are less relevant in controlling bad news withholding.

[Insert Table 4 Here]

4.2.3 Robustness tests on endogeneity

Our analysis suggests a negative association between internal control and crash risk. However, our empirical tests could suffer from endogeneity problems. Endogeneity can arise because of unobservable heterogeneity when unobservable firm-specific factors influence both internal control and crash risk. In addition, we use lagged *IC_INDEX* to mitigate the problem of simultaneity or reverse causality, but we remain concerned about the simultaneity because *IC_INDEX* is sticky across years. Thus, we perform a two-stage least square estimation to address these issues. Roberts and Whited (2012) suggest that a proper instrument must satisfy both relevance and exclusion conditions. Following these criteria, we use the average *IC_INDEX* of other firms in the same industry as the instrumental variable. We report the results of the instrumental variable approach in Panel A in Table 5. The coefficients on the fitted value of the internal control index (*IC_INDEX_HAT*) are significantly negative for both measures of crash risk. Thus, the negative association between internal control and crash risk holds after controlling for endogeneity based on the instrumental variable methodology.

In addition, we use internal control quality in the preceding period to assuage the potential simultaneity problem. We report the results in Panel B of Table 5. The coefficients on IC_INDEX_{t-1} are significantly negative for both measures for crash risk. Thus, the negative association between internal control and crash risk holds after using lagged internal control quality to assuage the simultaneity problem.

Following Zhou, Kim, and Yeung (2014), we include determinants of internal control quality as additional control variables in our regression to mitigate the endogeneity problem. These variables include the proportion of loss years in the prior three years (*LOSS*), foreign sales (*FSALE*), number of business segments (*SEGMENTS*), restructuring charge (*RESTRUCTURE*), big four audit (*BIG4*), and auditor change (*AUDCHANGE*). The definitions of these variables are in Appendix B. We report the results in Panel C of Table 5. The coefficients on *IC_INDEX* are significantly negative for both measures of crash risk. Thus, the negative association between internal control and future crash risk holds after including additional control variables to assuage the endogeneity problem.

Finally, we include firm fixed effects to account for unobservable, time invariant, firm-specific factors that may affect crash risk, to assuage the endogeneity problem. We report the results in Panel D of Table 5. The coefficients on *IC_INDEX* are significantly negative for both measures of crash risk. Thus, our results are robust to including firm fixed effects.

[Insert Table 5 Here]

4.3 Additional tests

Section 4.2 above suggests that internal controls affect crash risk by either limiting bad news withholding behavior or by reducing the probability of extreme negative events. In this section, we select factors that can influence the effects of internal control mechanisms on the bad news withholding behavior of managers and the effects of extreme negative events. We further investigate whether these factors affect the association between internal control and crash risk as our predicted directions. We select auditing as internal governance and market development as external governance mechanisms that can substitute for internal control in reducing crash risk. Accounting conservatism is selected to proxy firm ability to limit bad news withholding. Finally, ownership structure is selected as a factor that can affect the ability of firms to mitigate the effects of extreme negative events. For brevity, the results for additional tests are confined to the internal control index rather than the components.

4.3.1 Effect of Big Four audit firms

Companies must be audited to protect market participants. Prior studies show that auditors monitor financial reporting preparation (Becker et al., 1998; Lennox and Pittman, 2010) and provide advice on the internal control of companies. We test the role of auditor monitoring in the association between internal control and crash risk in this section. Dye (1993) indicates that the expected cost of litigation is greater for Big Four auditors than for non-Big Four auditors, especially when companies are bankrupt. Thus, Big Four auditors may have strong incentives to push companies to disclose bad news in a timely manner and to provide suggestions to help companies minimize the emergence and effects of extreme negative events. Internal control can play an important role in reducing crash risk when high-quality auditing is unavailable. Therefore, we predict that the auditor substitutes for internal control in lowering crash risk.

We divide the sample into two subsamples based on whether the auditor is a Big Four firm. As shown in Table 6, the coefficients of IC_INDEX_t are negative and significant when firms are audited by non-Big Four auditors (*BIG4* = 0) in Columns (2) and (4). In contrast, the same set of coefficients for firms with Big Four auditors (*BIG4* = 1) is not significant.[5] Overall, this result suggests that the auditor is likely to serve as a substitute for internal control in reducing crash risk.

[5] In Column (1) of Table 6, when *BIG4* = 1, the estimated coefficient of *IC_INDEX* is insignificant. However, we notice that the coefficient of *IC_INDEX is* -3.135 in Column (1) and -1.116 in Column (2). Therefore, we need to be cautious when interpret the results.

[Insert Table 6 Here]

4.3.2 Effect of market development

China has great disparities in external monitoring mechanisms across regions. We further explore whether regional differences in external monitoring affect the association between internal control and crash risk. We use the regional marketization index, which measures the progress of institutional transformation in the 31 provinces of China.[6] Additionally, we identify differences in institutions and economic policies across provinces. Fan, Wang, and Ma (2011) provide the indices across the 31 provinces. A high index value indicates a better external monitoring environment. We argue that strong external monitoring mechanisms substitute for internal control systems in reducing crash risk. Thus, we predict that the negative association between internal control and crash risk is more pronounced for firms in provinces with low market development than those in provinces with high market development.

We divide the sample into two subsamples based on whether a firm is located in a province with a marketization index lower than the sample median. As shown in Table 7, the coefficients of IC_INDEX_t are all negative and significant when the firms are in provinces with low market development (*MKT* = 0). In contrast, the same set of coefficients for firms in provinces with high market development (*MKT* = 1) is insignificant. Overall, the results suggest that the association between internal control and crash risk is significantly negative, mainly in provinces with weak external monitoring (i.e., lower market development).

[Insert Table 7 Here]

4.3.3 Effect of conditional accounting conservatism

Conditional accounting conservatism is interpreted as capturing accountants' tendency to require a higher degree of verification to recognize good news as gains than to recognize bad news as losses (Basu, 1997). This asymmetric verifiability requirement of accounting conservatism weakens managers'

[6] This index reflects the institutional heterogeneity across regions in China. This index has been widely used in studies, such as Wang, Wong, and Xia (2008), Chan, Lin and Wang (2012), and Hung, Wong, and Zhang (2012).

incentive and ability to overstate performance and suppress the disclosure of bad news (Watts, 2003; Kothari et al., 2010). Kim and Zhang (2015) document that firms with more conservative accounting policies have lower likelihood of future stock price crashes. We expect that firms applying less accounting conservatism accumulate more negative news and thus are more vulnerable to extreme negative events because their ability to absorb negative news is weaker. Thus, we expect that the negative association between internal control quality and crash risk is more pronounced for firms applying less accounting conservatism.

To capture firm-year level conservatism, we follow Kim and Zhang (2015) and Khan and Watts (2009) and use the following model:

$$\begin{aligned} X_i = {} & \beta_1 + \beta_2 \mathrm{D}_i + \mathrm{R}_i(\mu_1 + \mu_2 MKV_i + \mu_3 MB_i + \mu_4 LEV_i) + \mathrm{D}_i\mathrm{R}_i(\lambda_1 + \lambda_2 MKV_i + \lambda_3 MB_i + \lambda_4 LEV_i) \\ & + (\delta_1 MKV_i + \delta_2 MB_i + \delta_3 LEV_i + \delta_4 \mathrm{D}_i MKV_i + \delta_5 \mathrm{D}_i MB_i + \delta_6 \mathrm{D}_i LEV_i) + \varepsilon_i \end{aligned} \tag{5}$$

where X is net income scaled by lagged market value of equity; R is compound returns over the 12-month period ending at fiscal yearend; D is an indicator that equals 1 if the return is negative, zero otherwise; MKV is the natural log of market value; MB is the ratio of market value to book value of equity; LEV is debt-to-equity ratio; i indexes firm; and ε is the residual. We then calculate *CSCORE* using the following model:

$$CSCORE = \lambda_1 + \lambda_2 MKV_i + \lambda_3 MB_i + \lambda_4 LEV_i \tag{6}$$

We build a dummy variable *HCON*, which equals 1 if *CSCORE* of the preceding fiscal year is above the sample median, zero otherwise, and we divide the sample into two subsamples based on whether accounting conservatism is above the sample median. As shown in Table 8, the coefficients of IC_INDEX_t are all negative and significant for firms applying less accounting conservatism (*HCON* = 0). In contrast, the same set of coefficients for firms applying more accounting conservatism (*HCON* = 1) is insignificant. Overall, the results suggest that firms with less accounting conservatism are more susceptible to the effect of internal control on crash risk.

[Insert Table 8 Here]

4.3.4 Effect of ownership

Prior studies report that SOEs can receive aid from the government when they are affected by extreme negative events. SOEs can receive support from the government and attempt to avoid crash risk when they are affected by extreme negative events because of weak internal control. Thus, we predict that the negative association between internal control and crash risk is more pronounced for non-SOEs than SOEs.

We divide the sample into two subsamples based on whether a firm is state owned. As shown in Table 9, the coefficients of IC_INDEX_t are all negative and significant for non-SOEs (*SOE* = 0). In contrast, the same set of coefficients for SOEs (*SOE* = 1) is insignificant. Overall, our results indicate that the association between internal control and crash risk is confined to non-SOEs.

[Insert Table 9 Here]

5. Conclusion

We investigate whether internal control and its five components affect crash risk. Consistent with our prediction, we find that the quality of internal control is negatively associated with crash risk. Our results are robust to alternative proxies for crash risk and different econometric designs. Our results are consistent with the notion that internal control can curtail executive withholding of bad news, so that the likelihood of a stock price crash is less.

In addition, our findings suggest that not every component of internal control is equal. We document that control environment, information and communication, and monitoring components significantly reduce crash risk. In contrast, risk assessment and control activity components do not relate to crash risk. The differing results from different components of internal control show that, among the five components of internal control, control environment, monitoring, and information and communication are more relevant, while risk assessment and control activity components are less relevant in controlling bad news withholding.

We find that internal and external governance moderate the association between internal control quality and crash risk. That is, firms with weak auditing quality and poor market development have lower ability to mitigate the effect of extreme negative events. These results are consistent with the notion that the role of internal control in reducing crash risk is a partial substitute of high-quality auditing and external monitoring. These findings strengthen our conclusions, because they assuage the concern that the negative association between internal control and crash risk is driven by firms with both good internal control and strong corporate governance. Overall, this study documents evidence supporting the view that internal control limits the ability of managers to conceal bad news and helps reduce the probability of extreme negative events, which consequently lead to lower crash risk.

This study adds to the growing literature on internal control and its implications for managers and investors. We focus on the unique role of internal control in lowering crash risk and generate evidence on the capital market consequences of internal control. We also extend previous studies on crash risk by identifying a new factor that is significantly associated with crash risk. Thus, we uncover useful implications for managers and investors who wish to manage crash risk in the stock market.

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Appendix A

Crash Risk and Bad News Hoarding Cases

(1) Chongqing Brewer

The Economic Observer reported Chongqing Brewer's large drop in stock price on December 16, 2011 (http://www.eeo.com.cn/ens/2011/1216/218139.shtml, accessed September 04, 2015). *The Economic Observer* investigated Chongqing Brewery and reported that the firm "is suspiciously secretive with much of the key financial and legal data regarding research into a vaccine for Hepatitis B that it is involved with." The disclosure of a transfer of 8% ownership of a Chongqing Brewery subsidiary to two vaccine scientists revealed that the transfer might be illegal. This is because the scientists and their employers did not sign the transfer agreement. Reporters found that the transfer directly put the ownership of the shares in the hands of the son of one of the scientists. Consequently, Chongqing Brewer's stock price fell more than 40% from December 9 to December 15, 2011. This large drop in stock price (stock price crash) is an example of the firm deliberately hiding its news of illegal transfer of shares from shareholders and the public.

(2) Yili Group

Yili Group is a dairy product company in China. In September 2008, Yili had a recall of its milk products because its infant formula contained melamine (a toxic chemical normally used in making plastics and tanning leather). It was found that suppliers of milk to dairy companies used melamine to disguise diluted milk to make protein levels of the milk appear higher than they really were, allowing producers to cut costs by diluting their products. Investigations showed that as many as 372 milk-supplying stations had been adding the chemical since as early as April 2005. Some believe that executives in Yili Group knew the practice of adding the chemical before the news broke and several of these executives received jail time. After Yili Group's recall announcement, its own and competitors' share prices fell sharply.

Specifically, the Yili stock price hit an all-time low on September 17, 2008. The stock price crash in Yili is an example of exogenous disclosure of an event, in the form of milk contamination.

Appendix B

Variable Definitions

Variable	Definition of variable
Crash risk variables:	
$CRASH_t$	Dummy variable that takes the value 1 for a firm–year that experiences one or more firm-specific weekly returns falling 3.2 standard deviations below the mean firm-specific weekly return over fiscal year t, with 3.2 chosen to generate frequencies of 0.1% in the normal distribution during the fiscal year period, and zero otherwise
$NCSKEW_t$	Negative skewness of firm-specific weekly return over fiscal year t

For both crash risk variables, the firm-specific weekly return (W) is equal to ln(1+residual), where the residual is from the following expanded market model regression:

$$r_{i,\tau} = \alpha_i + \beta_{1,i} r_{m,\tau-2} + \beta_{2,i} r_{m,\tau-1} + \beta_{3,i} r_{m,\tau} + \beta_{4,i} r_{m,\tau+1} + \beta_{5,i} r_{m,\tau+2} + \varepsilon_{i,\tau}$$

Variable	Definition of variable
Internal control variables:	
IC_INDEX_t	Internal Control Index developed by the Xiamen University research group, which is published by three authoritative financial newspapers in China (*China Securities Journal*, *Shanghai Securities Journal*, and *Securities Times*) once a year
$CtrEnv_t$	Control Environment Component of the Internal Control Index
$RISK_t$	Risk Assessment Component of the Internal Control Index
$CtrAct_t$	Control Activities Component of the Internal Control Index
$InfoCom_t$	Information and Communication Component of the Internal Control Index
$MONITOR_t$	Monitoring Component of the Internal Control Index
Firm-level controls and conditional variables:	
$DTURN_{t-1}$	Average monthly share turnover during fiscal year t-1, minus the average monthly share turnover during fiscal year t-2, where monthly share turnover is calculated as monthly trading volume divided by total number of shares outstanding during the month
$NCSKEW_{t-1}$	Lagged value of $NCSKEW_t$
RET_{t-1}	Mean value of the firm-specific-weekly return over the fiscal year t-1, times 100
LEV_{t-1}	Leverage of the firm is measured by the debt-to-equity ratio over the fiscal year t-1

MB_{t-1}	Market value of equity divided by book value of equity at the end of fiscal year t-1
ROA_{t-1}	Income before extraordinary items divided by lagged total assets at the end of fiscal year t-1
$ACCM_{t-1}$	Prior three years' moving sum of the absolute value of discretionary accruals, where discretionary accruals are estimated from the Modified Jones Model (Dechow et al. (1995))
$Zmijevski_{t-1}$	Zmijewski's risk score (Zmijewski (1984))
$LOSS_{t-1}$	The proportion of loss years in the prior three years
$FSALES_{t-1}$	An indicator variable that equals 1 if the firm has foreign sales at the end of fiscal year t-1and 0 otherwise
$SEGMENTS_{t-1}$	The natural log of one plus the number of reported business segments at the end of fiscal year t-1
$RESTRUCTURE_{t-1}$	An indicator variable that equals 1 if the restructuring charge is nonzero at the end of fiscal year t-1and 0 otherwise
$BIG4_{t-1}$	Dummy variable that equals 1 if the firm is audited by one of the Big Four auditors or their predecessors at the end of fiscal year t-1, zero otherwise
$AUDCHANGE_{t-1}$	An indicator variable that equals 1 if the firm experiences auditor change in the year t-1 and 0 otherwise.
MKT_{t-1}	Dummy variable that equals 1 if the firm is located in a province with marketization index below the sample median, zero otherwise
$HCON_{t-1}$	Dummy variable that equals 1 if the extent of accounting conservatism is above sample median, zero otherwise; accounting conservatism is proxied by CSCORE, which is calculated by following Khan and Watts (2009) and Kim and Zhang (2015); higher CSCORE indicates more accounting conservatism
SOE_{t-1}	Dummy variable that equals 1 if the firm is state-owned, zero otherwise

Appendix C

Construction of Internal Control Index

We use the Chinese Internal Control Index, which is denoted by *IC_INDEX*, to measure the quality of internal control. All firms listed on the Shanghai Stock Exchange and on the Main Section of the Shenzhen Stock Exchange are included. Specifically, the index uses the COSO components—control environment, risk assessment, control activities, information and communication, and monitoring—as the five first-level criteria in internal control. The final index includes four levels of evaluation criteria, consisting of 5 first-level criteria, 24 second-level criteria, 43 third-level criteria, and 144 fourth-level criteria. Then, the analytic hierarchy process (AHP) is applied to transform the qualitative information obtained in the four levels of the evaluation system into a quantitative measurement of a firm's internal control. Details of the AHP analysis are as follows:

(1) Hierarchy Construction

The first step is to model the internal control evaluation problem as a hierarchy. First, we analyze the decision problem in-depth, extracting relevant factors and determining the relations among different factors. Second, we arrange different factors into an analytic hierarchy, in which each factor belongs to a particular hierarchy and is assigned to a factor in the upper hierarchy. The internal control evaluation system contains five hierarchies in the following top-to-bottom order: overall objectives, sub-objectives, standards, sub-standards, and plan executions.

(2) Judgment Matrix

After the hierarchy is constructed for evaluation of internal control, pairwise comparisons of the same-level items are performed for the sub-objective level, analyzing their relative importance to the same assigned elements in the hierarchy above them. Once the comparison is finished, each of the two items receives a score according to its relative importance. To perform the pairwise comparisons, we establish a judgment matrix according to Saaty's AHP 1-9 Scale (Saaty, 1988). The AHP 1-9 Scale is aimed at enhancing judgment accuracy and, therefore, weight credibility. Delphi method is applied to create the judgment matrix. Experts compare the relative importance between two factors and assign a value to each factor based on AHP 1-9 Scale. For example, if *control activities* is evaluated to "be slightly more important" than *monitoring*, then the value for *control activities* is 3 while the value of *monitoring* is 1/3. The remainders of the values are given analogously.

(3) Weight Calculation and Consistency Check

The objective evaluation method is applied to calculate the weight based on observed values. The objective evaluation method uses the variation coefficient that reflects the differences in information between items to calculate the weight. We use the aforementioned methods to obtain the weight for each item in the hierarchy.

(4) Calculation of Internal Control Index

The internal control index is based on the observed values and calculated weights. It is the weighted average of each item. For those items whose scores are listed as *"To be standardized"* at the fourth level, the standardized score is calculated as the actual score on this item for the evaluated firm divided by the maximum score on the same item from all the listed companies. The weighted average calculation method is as follows.

$$IC\_INDEX = w_1 IC_1 + w_2 IC_2 + w_3 IC_3 + w_4 IC_4 + w_5 IC_5$$

where IC_INDEX is the overall internal control index, IC_1 is the control environment index, IC_2 is the risk assessment index, IC_3 is the control activities index, IC_4 is the information and communication index, IC_5 is the monitoring index, and w_i is the weight of the i^{th} item at the first level (i=1,2,3,4,5). In addition,

$$IC_i = \left(\sum_{j=1}^{n} w_{i,j} IC_{i,j}\right)*(1-p_i),\ i=1,2,3,4,5;\ j=1,2,3,...,n$$

where $IC_{i,j}$ is the value of the j^{th} item at the fourth level associated with the i^{th} item at the first level, $w_{i,j}$ is the impact of the j^{th} item at the fourth level on the associated i^{th} item at the first level. P_i is the deduction ratio of the special category—punishment or other negative events—at the first level. The final internal control index is a percentage score with a maximum value of 100% and a minimum value of 0%.

Table 1 Sample selection and industry distribution

Panel A: Selection criteria

Total firm-year observations available on RESSET and CSMAR databases from 2007 to 2012		10938
Deduct：		
	Observations in the financial industry	(204)
	Observations without internal control index	(124)
	Observations with missing data to calculate control variables	(2115)
Final sample		8495

Panel B: Sample composition by industry

Industry Group	Number	Percentage
Agriculture, forestry and fishing	139	1.64%
Mining	212	2.50%
Manufacturing	5040	59.33%
Utilities	407	4.79%
Construction	157	1.85%
Transportation	351	4.13%
Information and Technology	428	5.04%
Wholesale trade	561	6.60%
Real estate	623	7.33%
Services	234	2.75%
Entertainment	34	0.40%
Conglomerates	309	3.64%
Total	8495	100.00%

Panel C: Sample composition by year

Year	Number	Percentage
2007	1176	13.84%
2008	1257	14.80%
2009	1374	16.17%
2010	1451	17.08%
2011	1506	17.73%
2012	1731	20.38%
Total	8495	100.00%

Table 2 Descriptive statistics and Correlation Matrix

Panel A: Descriptive Statistics						
Variable	N	Mean	Median	Std. Dev	Q1	Q3
$CRASH_{t}$	8495	0.097	0.000	0.296	0.000	0.000
$NCSKEW_{t}$	8495	-0.199	-0.180	0.642	-0.567	0.205
IC_INDEX_{t}	8495	0.387	0.387	0.106	0.311	0.459
$CtrEnv_{t}$	8495	0.348	0.331	0.150	0.257	0.453
$RISK_{t}$	8495	0.198	0.181	0.141	0.096	0.258
$CtrAct_{t}$	8495	0.546	0.552	0.164	0.421	0.669
$InfoCom_{t}$	8495	0.495	0.478	0.120	0.417	0.534
$MONITOR_{t}$	8495	0.344	0.334	0.185	0.190	0.467
$DTURN_{t-1}$	8495	-0.071	-0.052	0.476	-0.355	0.261
$NCSKEW_{t-1}$	8495	-0.188	-0.171	0.619	-0.549	0.200
$SIGMA_{t-1}$	8495	0.054	0.052	0.018	0.041	0.064
RET_{t-1}	8495	-0.160	-0.131	0.110	-0.205	-0.083
$SIZE_{t-1}$	8495	8.234	8.109	1.048	7.513	8.835
LEV_{t-1}	8495	0.510	0.515	0.214	0.362	0.649
MB_{t-1}	8495	3.770	2.924	3.469	1.787	4.763
ROA_{t}	8495	0.059	0.047	0.091	0.016	0.092
$ACCM_{t-1}$	8495	0.226	0.182	0.163	0.110	0.292
$Zmijevski_{t-1}$	8495	0.080	0.012	0.169	0.001	0.078

Panel B: Pearson correlation matrix

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*
(1)CRASH $_t$	**1.00**	**0.48**	**-0.02**	**-0.03**	-0.01	-0.01	-0.02	-0.01	0.03	-0.01	**-0.03**	**0.02**	0.01	-0.02	**0.05**	**-0.02**	0.01	0.01
(2)NCSKEW $_t$		1.00	**-0.12**	**-0.07**	**-0.08**	**-0.09**	**-0.06**	**-0.13**	**0.16**	**0.08**	**0.10**	**-0.10**	**0.04**	0.01	**0.10**	0.00	0.01	**0.03**
(3)IC_INDEX $_t$			1.00	**0.76**	**0.61**	**0.73**	**0.57**	**0.70**	**-0.22**	**-0.10**	**-0.32**	**0.30**	**0.40**	**-0.11**	**-0.04**	**0.15**	**-0.04**	**-0.18**
(4)CtrEnv $_t$				1.00	**0.27**	**0.38**	**0.32**	**0.32**	**-0.10**	**-0.03**	**-0.14**	**0.14**	**0.40**	**-0.08**	**0.00**	**0.16**	**-0.05**	**-0.15**
(5)RISK $_t$					1.00	**0.34**	**0.28**	**0.40**	**-0.13**	**-0.07**	**-0.25**	**0.23**	**0.23**	0.00	**-0.09**	**0.05**	0.00	**-0.05**
(6)CtrAct $_t$						1.00	**0.32**	**0.42**	**-0.21**	**-0.07**	**-0.27**	**0.25**	**0.23**	**-0.15**	**-0.06**	**0.13**	**-0.04**	**-0.20**
(7)InfoCom $_t$							1.00	**0.26**	**-0.11**	**-0.06**	**-0.16**	**0.15**	**0.26**	**-0.06**	0.01	**0.09**	**-0.02**	**-0.11**
(8)MONITOR $_t$								1.00	**-0.21**	-0.14	**-0.32**	**0.29**	**0.19**	**-0.07**	-0.02	**0.04**	-0.01	**-0.07**
(9)DTURN $_{t-1}$									1.00	**-0.06**	**0.35**	**-0.35**	**0.06**	**0.11**	**0.12**	**-0.03**	**-0.05**	**0.03**
(10)NCSKEW $_{t-1}$										1.00	**0.04**	-0.01	**-0.09**	0.02	**-0.05**	**-0.04**	-0.01	**0.04**
(11)SIGMA $_{t-1}$											1.00	**-0.98**	**-0.07**	**0.12**	**0.29**	**-0.05**	**0.09**	**0.12**
(12)RET $_{t-1}$												1.00	**0.05**	**-0.12**	**-0.29**	**0.06**	**-0.08**	**-0.12**
(13)SIZE $_{t-1}$													1.00	**-0.06**	**0.18**	**0.26**	-0.02	**-0.14**
(14)LEV $_{t-1}$														1.00	**-0.06**	**-0.23**	**0.17**	**0.65**
(15)MB $_{t-1}$															1.00	**0.15**	**0.07**	**-0.04**
(16)ROA $_t$																1.00	**0.06**	**-0.40**
(17)ACCM $_{t-1}$																	1.00	**0.17**
(18)Zmijevski $_{t-1}$																		1.00

Notes: This table reports summary statistics and correlations for the sample. Panel A of this table presents summary statistics for the main research variables. Panel B of this table presents the correlation matrix of the main research variables. Bold text in Panel B indicates significance at the 0.05 level or better (two-tailed). See Appendix B for the details of variable definitions.

Table 3 The Effect of Internal Control on Crash Risk (H1)

	$CRASH_t$		$NCSKEW_t$	
Variable	Coef.	χ^2	Coef.	t-value
IC_INDEX_t	-0.926**	3.85	-0.228***	-2.69
$DTURN_{t-1}$	0.015	0.02	0.025	1.16
$NCSKEW_{t-1}$	0.002	0.00	0.079***	6.60
$SIGMA_{t-1}$	-46.24***	21.37	1.339	0.67
RET_{t-1}	-5.114***	9.81	0.292	0.90
$SIZE_{t-1}$	0.048	1.09	0.049***	5.82
LEV_{t-1}	-0.551**	5.44	-0.037	-0.82
MB_{t-1}	0.048***	16.90	0.009***	3.64
ROA_t	-1.315**	5.78	-0.087	-0.96
$ACCM_{t-1}$	0.312	1.38	0.073	1.56
$Zmijewski_{t-1}$	0.350	1.16	0.130**	2.12
Constant	-0.900*	2.98	-0.729***	-7.20
INDUSTRY	Yes		Yes	
YEAR	Yes		Yes	
$Adj.R^2$/-2 Log L	5270.445		0.086	
Observations	8495		8495	

Notes: The dependent variables in the table are proxies for crash risk, which are *CRASH* and *NCSKEW* respectively. *CRASH* equals one if a firm experiences one or more firm-specific weekly returns (i.e., $W_{i,\tau}$) falling 3.2 standard deviations below the mean firm-specific weekly returns for that fiscal year. *NCSKEW* is computed by taking the negative of third moment of returns and dividing it by the standard deviation of returns raised to the third power. *IC_INDEX* is constructed by the internal control research center of Xiamen University. The values of *IC_INDEX* range from 0 to 1 and a higher value of *IC_INDEX* corresponds to higher quality of internal control. See Appendix B for the definitions of other variables. The standard errors are adjusted for clustering by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level or better, respectively (two tailed).

Table 4 The Effect of the Five Components of Internal Control on Crash Risk (H1a – H1e)

Panel A: Dependent Variable-*CRASH*$_t$

	Column(1)		*Column(2)*		*Column(3)*		*Column(4)*		*Column(5)*		*Column(6)*	
Variable	Coef.	χ^2	Coef.	χ^2	Coef.	χ^2	Coef.	χ^2	Coef.	χ^2	Coef.	χ^2
$CtrEnv_t$	-0.721**	5.83									-0.664**	4.56
$RISK_t$			-0.365	1.41							0.210	0.42
$CtrAct_t$					-0.342	1.65					0.172	0.37
$InfoCom_t$							-0.767**	4.91			-0.820**	5.05
$MONITOR_t$									-0.632***	7.59	-0.070	0.08
$DTURN_{t-1}$	0.003	0.00	0.001	0.00	-0.007	0.00	0.010	0.01	-0.021	0.05	0.000	0.00
$NCSKEW_{t-1}$	0.013	0.04	0.035	0.30	0.034	0.28	0.031	0.23	0.018	0.07	0.010	0.02
$SIGMA_{t-1}$	-44.356***	19.75	-15.024	2.13	-14.400	1.98	-13.932	1.86	-17.522*	2.89	-44.084***	18.75
RET_{t-1}	-4.921***	9.06	-1.651	1.00	-1.558	0.90	-1.468	0.80	-1.892	1.32	-4.869***	8.73
$SIZE_{t-1}$	0.054	1.39	0.002	0.00	0.000	0.00	0.011	0.06	0.000	0.00	0.060	1.63
LEV_{t-1}	-0.544**	5.32	-0.541**	5.43	-0.556**	5.75	-0.543**	5.49	-0.547**	5.60	-0.539**	5.25
MB_{t-1}	0.047***	16.16	0.040***	12.38	0.040***	12.29	0.041***	12.76	0.040***	12.28	0.048***	16.35
ROA_t	-1.293**	5.56	-1.129**	4.36	-1.089**	4.09	-1.107**	4.25	-1.115**	4.29	-1.285	5.51
$ACCM_{t-1}$	0.294	1.23	0.231	0.78	0.228	0.75	0.217	0.69	0.226	0.74	0.283	1.14
$Zmijewski_{\ t-1}$	0.364	1.27	0.443	1.85	0.410	1.57	0.408	1.56	0.433	1.80	0.345	1.11
Constant	-1.148**	5.04	-1.284**	6.28	-1.165**	4.84	-1.068**	4.16	-1.032**	3.93	-0.924	2.82
INDUSTRY	Yes		Yes		Yes		Yes		Yes		Yes	
YEAR	Yes		Yes		Yes		Yes		Yes		Yes	
-2 Log L	5220.108		5220.541		5220.343		5217.170		5214.290		5262.944	
Observations	8495		8495		8495		8495		8495		8495	

Panel B: Dependent Variable-*NCSKEW*$_t$												
	Column(1)		*Column(2)*		*Column(3)*		*Column(4)*		*Column(5)*		*Column(6)*	
Variable	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
CtrEnv$_t$	-0.177***	-3.34									-0.168***	-3.05
RISK$_t$			-0.028	-0.54							0.020	0.36
CtrAct$_t$					0.008	0.17					0.081	1.63
InfoCom$_t$							-0.028	-0.44			0.007	0.10
MONITOR$_t$									-0.133***	-3.01	-0.130***	-2.73
DTURN$_{t-1}$	0.021	0.99	0.024	1.12	0.023	1.09	0.023	1.09	0.030	1.38	0.027	1.27
NCSKEW$_{t-1}$	0.081***	6.84	0.081***	6.78	0.081***	6.80	0.081	6.78***	0.075***	6.25	0.077***	6.37
SIGMA$_{t-1}$	1.916	0.95	1.622	0.81	1.735	0.86	1.705	0.85	0.953	0.47	1.397	0.69
RET$_{t-1}$	0.353	1.08	0.302	0.93	0.313	0.96	0.311	0.96	0.254	0.78	0.312	0.95
SIZE$_{t-1}$	0.050***	5.93	0.043***	5.21	0.042***	5.19	0.042	5.24***	0.044***	5.49	0.050 ***	5.75
LEV$_{t-1}$	-0.036	-0.80	-0.040	-0.88	-0.042	-0.91	-0.041	-0.89	-0.041	-0.91	-0.037	-0.82
MB$_{t-1}$	0.009***	3.52	0.009***	3.72	0.010***	3.74	0.010	3.73***	0.010***	3.85	0.009***	3.67
ROA$_t$	-0.081	-0.89	-0.098	-1.08	-0.099	-1.08	-0.098	-1.07	-0.096	-1.05	-0.085	-0.94
ACCM$_{t-1}$	0.069	1.48	0.077	1.64	0.078	1.64	0.077	1.63	0.078*	1.65	0.071	1.51
Zmijewski $_{t-1}$	0.132**	2.17	0.145**	2.38	0.147**	2.39	0.144	2.35**	0.144**	2.36	0.143**	2.32
Constant	-0.792***	-7.90	-0.774***	-7.74	-0.780***	-7.62	-0.767	-7.51***	-0.718***	-7.07	-0.773***	-7.30
INDUSTRY	Yes		Yes		Yes		Yes		Yes		Yes	
YEAR	Yes		Yes		Yes		Yes		Yes		Yes	
Adj.R^2	0.086		0.085		0.085		0.085		0.086		0.087	
Observations	8495		8495		8495		8495		8495		8495	

Notes: This table presents the results for effects of the five components of internal control on crash risk. The dependent variables in the table are proxies for crash risk, which are CRASH (Panel A) and NCSKEW (Panel B) respectively. *CtrEnv*, *RISK*, *CtrAct*, *InfoCom*, and *MONITOR* are the five components separated from IC_INDEX, with their values range from 0 to 1. Higher values of the five sub-indexes correspond to higher quality of internal control. See Appendix B for the definitions of other variables. The standard errors are adjusted for clustering by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level or better, respectively (two tailed).

Table 5 Regression Analysis to Address Endogeneity Problems

Panel A: Industry instrumental variable

	$CRASH_t$		$NCSKEW_t$	
Variable	Coef.	Chi^2	Coef.	t-value
$IC\_INDEX\_HAT_t$	-6.936**	5.12	-1.623***	-2.71
$DTURN_{t-1}$	-0.094	0.78	-0.006	-0.27
$NCSKEW_{t-1}$	0.048	0.55	0.090***	7.64
$SIGMA_{t-1}$	-19.507*	3.41	9.057***	4.25
RET_{t-1}	-2.378	2.00	1.105***	3.31
$SIZE_{t-1}$	-0.014	0.10	0.034***	4.35
LEV_{t-1}	-0.536**	5.30	-0.036	-0.80
MB_{t-1}	0.038***	11.17	0.006**	2.56
ROA_t	-1.189**	4.83	-0.053	-0.59
$ACCM_{t-1}$	0.228	0.75	0.047	1.03
$Zmijewski_{t-1}$	0.431	1.77	0.140**	2.32
Constant	1.750	1.44	-0.132	-0.47
INDUSTRY	Yes		Yes	
YEAR	Yes		Yes	
Adj.R^2*/-2 Log L*	5216.239		0.095	
Observations	8495		8495	

Panel B: Lag IC_INDEX

	$CRASH_t$		$NCSKEW_t$	
Variable	Coef.	Chi^2	Coef.	t-value
IC_INDEX_{t-1}	-0.014***	6.77	-0.002**	-2.50
$DTURN_{t-1}$	-0.058	0.32	-0.002	-0.12
$NCSKEW_{t-1}$	-0.040	0.32	0.075***	5.73
$SIGMA_{t-1}$	-13.639	1.56	10.115***	4.65
RET_{t-1}	-1.046	0.36	1.261***	3.74
$SIZE_{t-1}$	0.044	0.76	0.057***	6.36
LEV_{t-1}	-0.514**	4.19	-0.054	-1.14
MB_{t-1}	0.045***	15.38	0.008***	3.32
ROA_t	-0.709	1.49	0.164*	1.67
$ACCM_{t-1}$	0.320	1.39	0.068	1.38
$Zmijewski_{t-1}$	0.663*	3.68	0.233***	3.77
Constant	-1.304**	5.10	-0.955***	-8.78
INDUSTRY	Yes		Yes	
YEAR	Yes		Yes	
Adj.R^2*/-2 Log L*	4443.294		0.092	
Observations	7308		7308	

Panel C: include internal control quality variable

Variable	$CRASH_t$ Coef.	$CRASH_t$ Chi^2	$NCSKEW_t$ Coef.	$NCSKEW_t$ t-value
IC_INDEX_t	-1.336***	7.21	-0.278***	-3.35
$DTURN_{t-1}$	-0.021	0.04	0.013	0.63
$NCSKEW_{t-1}$	-0.006	0.01	0.079***	6.59
$SIGMA_{t-1}$	-12.704	1.47	9.830***	4.71
RET_{t-1}	-1.267	0.57	1.271***	3.88
$SIZE_{t-1}$	0.015	0.09	0.045***	5.07
LEV_{t-1}	-0.466*	3.80	-0.025	-0.54
MB_{t-1}	0.042***	11.92	0.006**	2.43
ROA_t	-0.904	2.14	0.059	0.62
$ACCM_{t-1}$	0.155	0.34	0.025	0.52
$Zmijewski_{t-1}$	0.422	1.52	0.101	1.55
$LOSS_t$	-0.126	0.25	0.100**	2.30
$FSALES_t$	-0.279	0.63	-0.117*	-1.78
$SEGMENTS_t$	-0.036	0.46	-0.013	-1.48
$RESTRUCTURE_t$	-0.051	0.37	-0.023	-1.39
$BIG4_t$	0.209	1.41	0.014	0.43
$AudChang_t$	0.113	0.63	0.000	-0.01
Constant	-0.934	2.69	-0.756***	-7.25
INDUSTRY	Yes		Yes	
YEAR	Yes		Yes	
Adj.R^2/-2 Log L	*4933.766*		*0.099*	
Observations	*8124*		*8124*	

Panel D: Firm fixed effect

Variable	$CRASH_t$ Coef.	$CRASH_t$ Chi2	$NCSKEW_t$ Coef.	$NCSKEW_t$ t-value
IC_INDEX_t	-2.373***	8.43	-0.377***	-3.16
$DTURN_{t-1}$	0.092	0.23	-0.034	-1.43
$NCSKEW_{t-1}$	-0.642***	48.62	-0.111***	-9.00
$SIGMA_{t-1}$	-37.591**	5.17	2.845	1.22
RET_{t-1}	-2.970	1.31	0.198	0.56
$SIZE_{t-1}$	0.551***	11.77	0.168***	7.16
LEV_{t-1}	-1.334*	3.80	0.054	0.65
MB_{t-1}	0.074***	7.25	0.006*	1.75
ROA_t	-1.789	2.24	-0.557***	-4.73
$ACCM_{t-1}$	0.165	0.10	0.006	0.09
$Zmijewski_{t-1}$	-0.028	0.00	-0.220**	-2.58
Firm	Yes		Yes	
YEAR	Yes		Yes	
Adj.R2/-2 Log L	3184.003		0.316	

Notes: This table presents the analysis to address endogeneity concerns on the effect of internal control on crash risk. *LOSS* is the proportion of loss years in the prior three years. *FSALES* equals one if the firm has foreign sales and zero otherwise. *SEGMENTS* is the natural log of one plus the number of reported business segments.

RESTRUCTURE equals one if the firm has experienced a restructure and zero otherwise. *BIG4* equals one if the firm is audited by one of the Big Four auditors or their predecessors, zero otherwise. *AudChang* is an indicator, which equals one if the firm changed auditor in the year and zero otherwise. See Appendix B for the definitions of other variables. The standard errors are adjusted for clustering by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level or better, respectively (two tailed).

Table 6 The Effect of Audit Quality on the Relationship between Internal Control and Crash Risk

	$CRASH_t$				*$NCSKEW_t$*			
	Column (1)/BIG4 =1		*Column (2)/BIG4 = 0*		*Column (3)/BIG4=1*		*Column (4)/BIG4=0*	
Variable	Coef.	χ^2	Coef.	χ^2	Coef.	t-value	Coef.	t-value
IC_INDEX_t	-3.135	2.14	-1.116**	5.29	0.118	0.40	-0.252***	-2.83
$DTURN_{t-1}$	0.300	0.22	-0.030	0.09	0.271***	3.11	0.006	0.29
$NCSKEW_{t-1}$	-0.095	0.11	0.031	0.21	0.042	0.87	0.079***	6.33
$SIGMA_{t-1}$	0.058	0.00	-12.930	1.49	-7.108	-0.88	2.289	1.08
RET_{t-1}	8.489	0.20	-1.417	0.71	-0.808	-0.51	0.422	1.24
$SIZE_{t-1}$	0.030	0.04	0.025	0.22	0.049*	1.86	0.054***	5.76
LEV_{t-1}	-2.085*	3.33	-0.470**	4.00	0.014	0.05	-0.033	-0.73
MB_{t-1}	0.059	0.56	0.038***	11.06	0.016	1.07	0.009***	3.54
ROA_t	0.088	0.00	-1.155**	4.29	0.503	1.26	-0.129	-1.38
$ACCM_{t-1}$	0.219	0.03	0.209	0.61	0.135	0.70	0.068	1.41
$Zmijewski_{t-1}$	1.223	0.46	0.337	1.05	-0.470	-0.97	0.142**	2.40
Constant	-10.256***	19.81	-1.158**	4.20	-1.033***	-2.99	-0.792***	-7.23
INDUSTRY	Yes		Yes		Yes		Yes	
YEAR	Yes		Yes		Yes		Yes	
Adj.R^2/-2 Log L	299.215		4883.088		0.151		0.087	
Observations	546		7949		546		7949	

Notes: The dependent variables in the table are proxies for crash risk, which are *CRASH* and *NCSKEW* respectively. *CRASH* equals one if a firm experiences one or more firm-specific weekly returns (i.e., $W_{i,\tau}$) falling 3.2 standard deviations below the mean firm-specific weekly returns for that fiscal year. *NCSKEW* is computed by taking the negative of third moment of returns and dividing it by the standard deviation of returns raised to the third power. IC_INDEX is constructed by the internal control research center of Xiamen University. The values of *IC_INDEX* range from 0 to 1 and a higher value of *IC_INDEX* corresponds to higher quality of internal control. *CtrEnv*, *RISK*, *CtrAct*, *InfoCom*, and *MONITOR* are the five components separated from IC_INDEX, with their values range from 0 to 1. Higher values of the five sub-indexes correspond to higher quality of internal control. *BIG4* equals one if the firm is audited by one of the Big Four auditors or their predecessors, zero otherwise. See Appendix B for the definitions of other variables. The standard errors are adjusted for clustering by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level or better, respectively (two tailed).

Table 7 The Effect of Marketization on the Relationship between Internal Control and Crash Risk

	$CRASH_t$				*$NCSKEW_t$*			
	Column(1)/MKT=1		*Column(2)/MKT=0*		*Column (3)/MKT=1*		*Column (4)/MKT=0*	
Variable	Coef.	χ^2	Coef.	χ^2	Coef.	t-value	Coef.	t-value
IC_INDEX_t	-0.988	2.22	-1.424**	4.56	-0.102	-1.220	-0.252***	-2.83
$DTURN_{t-1}$	-0.100	0.55	0.074	0.24	-0.017	-0.810	0.006	0.29
$NCSKEW_{t-1}$	-0.047	0.25	0.087	0.95	0.049***	4.030	0.079***	6.33
$SIGMA_{t-1}$	-19.205	1.75	-13.006	0.77	4.124**	1.930	2.289	1.08
RET_{t-1}	-2.249	0.86	-1.091	0.22	0.450	1.300	0.422	1.24
$SIZE_{t-1}$	-0.039	0.40	0.089	1.58	0.017**	2.050	0.054***	5.76
LEV_{t-1}	-0.445	1.76	-0.503	2.19	-0.003	-0.060	-0.033	-0.73
MB_{t-1}	0.034*	3.34	0.039***	7.75	0.004	1.460	0.009***	3.54
ROA_t	-0.621	0.56	-1.306*	3.50	-0.118	-1.210	-0.129	-1.38
$ACCM_{t-1}$	-0.147	0.16	0.536	2.02	-0.049	-1.160	0.068	1.41
$Zmijewski_{t-1}$	0.266	0.21	0.304	0.57	0.041	0.600	0.142**	2.40
Constant	-0.597	0.73	-1.410*	3.02	-0.418***	-4.280	-0.792***	-7.23
INDUSTRY	Yes		Yes		Yes		Yes	
YEAR	Yes		Yes		Yes		Yes	
Adj.R^2/-2 Log L	2560.356		2618.595		0.151		0.087	
Observations	4206		4289		4206		4289	

Notes: The dependent variables in the table are proxies for crash risk, which are *CRASH* and *NCSKEW* respectively. *CRASH* equals one if a firm experiences one or more firm-specific weekly returns (i.e., $W_{i,\tau}$) falling 3.2 standard deviations below the mean firm-specific weekly returns for that fiscal year. *NCSKEW* is computed by taking the negative of third moment of returns and dividing it by the standard deviation of returns raised to the third power. IC_INDEX is constructed by the internal control research center of Xiamen University. The values of *IC_INDEX* range from 0 to 1 and a higher value of *IC_INDEX* corresponds to higher quality of internal control. *CtrEnv*, *RISK*, *CtrAct*, *InfoCom*, and *MONITOR* are the five components separated from *IC_INDEX*, with their values range from 0 to 1. Higher values of the five sub-indexes correspond to higher quality of internal control. *MKT* equals one if the firm is located in a province with marketization index below the sample median, zero otherwise. See Appendix B for the definitions of other variables. The standard errors are adjusted for clustering by firm. **, and * denote statistical significance at the 1%, 5%, and 10% level or better, respectively (two tailed).

Table 8 The Effect of Accounting Conservatism on the Relationship between Internal Control and Crash Risk

	$CRASH_t$				$NCSKEW_t$			
	Column(1)/HCon=1		*Column(2)/ HCon =0*		*Column(3)/ HCon =1*		*Column(4) HCon =0*	
Variable	Coef.	Chi^2	Coef.	Chi^2	Coef.	t-value	Coef.	t-value
IC_INDEX_t	-0.764	1.46	-1.087*	2.73	-0.163	-1.51	-0.329***	-2.69
$DTURN_{t-1}$	0.200	0.99	-0.157	1.67	0.022	0.66	0.023	0.83
$NCSKEW_{t-1}$	0.106	1.35	-0.038	0.17	0.104***	6.74	0.065***	3.70
$SIGMA_{t-1}$	-34.576**	5.09	-11.228	0.56	6.063*	1.95	2.649	0.96
RET_{t-1}	-4.877**	4.05	-0.407	0.03	0.693	1.37	0.554	1.28
$SIZE_{t-1}$	-0.097	2.07	0.122*	3.39	0.042***	3.63	0.074***	5.59
LEV_{t-1}	-0.318	0.86	-0.556*	2.96	0.058	0.89	-0.191***	-2.93
MB_{t-1}	0.032**	3.89	0.067***	13.73	0.004	1.26	0.008*	1.95
ROA_t	-0.989	1.84	-1.477*	3.59	-0.256**	-2.11	0.218	1.64
$ACCM_{t-1}$	-0.112	0.08	0.534	2.30	-0.021	-0.32	0.138**	2.02
$Zmijewski_{t-1}$	0.480	1.32	0.330	0.46	0.090	1.08	0.222**	2.55
Constant	-0.167	0.05	-1.925**	6.70	-0.920***	-6.13	-0.886***	-6.07
INDUSTRY	Yes		Yes		Yes		Yes	
YEAR	Yes		Yes		Yes		Yes	
$Adj.R^2$/-2 Log L	2533.168		2631.698		0.096		0.101	
Observations	4248		4247		4245		4250	

Notes: The dependent variables in the table are proxies for crash risk, which are *CRASH* and *NCSKEW* respectively. *CRASH* equals one if a firm experiences one or more firm-specific weekly returns (i.e., $W_{i,\tau}$) falling 3.2 standard deviations below the mean firm-specific weekly returns for that fiscal year. *NCSKEW* is computed by taking the negative of third moment of returns and dividing it by the standard deviation of returns raised to the third power. IC_INDEX is constructed by the internal control research center of Xiamen University. The values of *IC_INDEX* range from 0 to 1 and a higher value of *IC_INDEX* corresponds to higher quality of internal control. *CtrEnv*, *RISK*, *CtrAct*, *InfoCom*, and *MONITOR* are the five components separated from *IC_INDEX*, with their values range from 0 to 1. Higher values of the five sub-indexes correspond to higher quality of internal control. *HCon* equals one if the extent of accounting conservatism is above sample median, zero otherwise. Accounting conservatism is proxied by CSCORE which is calculated by following Khan and Watts (2009) and Kim and Zhang (2015). A higher CSCORE indicates more accounting conservatism. See Appendix B for the definitions of other variables. The standard errors are adjusted for clustering by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level or better, respectively (two tailed).

Table 9 The Effect of Ownership on the Relationship between Internal Control and Crash Risk

	$CRASH_t$				$NCSKEW_t$			
	Column(1)/SOE=1		*Column(2)/SOE=0*		*Column (3)/SOE=1*		*Column (4)/SOE=0*	
Variable	Coef.	Chi^2	Coef.	Chi^2	Coef.	t-value	Coef.	t-value
IC_INDEX_t	-0.109	0.03	-2.090***	7.55	-0.007	-0.06	-0.555***	-3.76
$DTURN_{t-1}$	0.130	0.57	0.017	0.01	0.079***	2.68	-0.016	-0.53
$NCSKEW_{t-1}$	0.055	0.38	-0.072	0.50	0.087***	5.88	0.064***	3.21
$SIGMA_{t-1}$	-36.895***	7.36	-59.524***	15.48	2.263	0.91	0.176	0.05
RET_{t-1}	-3.690*	2.88	-7.039***	7.93	0.341	0.84	0.275	0.51
$SIZE_{t-1}$	0.020	0.11	0.110	2.03	0.041***	3.83	0.080***	5.46
LEV_{t-1}	-0.590*	3.30	-0.234	0.43	-0.053	-0.85	0.028	0.40
MB_{t-1}	0.063***	14.86	0.036**	4.63	0.012***	3.51	0.008**	2.27
ROA_t	-1.326*	2.79	-1.488*	3.51	-0.250*	-1.85	-0.025	-0.20
$ACCM_{t-1}$	-0.319	0.62	0.684*	3.58	0.000	0.01	0.099	1.37
$Zmijewski_{t-1}$	0.672	2.39	-0.303	0.32	0.046	0.53	0.161*	1.80
Constant	-1.084	2.46	-0.906	1.16	-0.759***	-5.97	-0.808***	-4.72
INDUSTRY	Yes		Yes		Yes		Yes	
YEAR	Yes		Yes		Yes		Yes	
Adj.R^2/-2 Log L	3022.141		2184.540		0.103		0.080	
Observations	5115		3380		5115		3380	

Notes: The dependent variables in the table are proxies for crash risk, which are *CRASH* and *NCSKEW* respectively. *CRASH* equals one if a firm experiences one or more firm-specific weekly returns (i.e., $W_{i,\tau}$) falling 3.2 standard deviations below the mean firm-specific weekly returns for that fiscal year. *NCSKEW* is computed by taking the negative of third moment of returns and dividing it by the standard deviation of returns raised to the third power. IC_INDEX is constructed by the internal control research center of Xiamen University. The values of *IC_INDEX* range from 0 to 1 and a higher value of *IC_INDEX* corresponds to higher quality of internal control. *CtrEnv*, *RISK*, *CtrAct*, *InfoCom*, and *MONITOR* are the five components separated from *IC_INDEX*, with their values range from 0 to 1. Higher values of the five sub-indexes correspond to higher quality of internal control. *SOE* equals one if the firm is state-owned, zero otherwise. See Appendix B for the definitions of other variables. The standard errors are adjusted for clustering by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level or better, respectively (two tailed).