Which Independent Directors Are Aligned with Shareholder? Evidence from Independent Executive Directors and Stock Crash Risk.

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Abstract

Prior literature provides limited understanding of how the backgrounds of independent directors affect stock crash risk. In this paper, we expand the current literature and find that independent directors, who are serving as executives in other firms, benefit shareholders by substantially reducing stock crash risk. Their presence lessens financial reporting problems and offsets the negative impact of poor corporate governance, CEO overconfidence, and excessive managerial option inducements on this risk. Crucially, we are the first to show that boards with these directors demonstrate a heightened commitment to accountability, with a strong tendency to oust CEOs responsible for stock crashes. Furthermore, our findings carry significant implications for shareholders, emphasizing the value of factoring in career-advancement incentives when structuring the board to enhance effective monitoring.

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1. Introduction

The board of directors plays a vital role in protecting shareholder value and over the last two decades, significant reforms have occurred in corporate governance to empower independent directors. With regulatory developments in the board structure such as Sarbanes-Oxley Act, SEC's 2009 and 2021 reforms[1], independent directors now come from various backgrounds (e.g., Linck, Netter, and Yang, 2008; Cao, Upadhyay, and Zeng 2024) and prior literature finds that these directors heterogeneously affect shareholder value through various channels (e.g., Jin, Su, Wang, and Xiao, 2022; Cao et al., 2024). In this paper, we expand the current literature by examining if primary profession of independent directors[2] affect shareholder value in the context of stock crash risk.

Academics have long been interested in exploring the causes of the negative skewness in stock returns. A common justification is the bad news hoarding of entrenched managers (e.g., Kothari, Shu, and Wysocki, 2009). Unfavorable news accumulation eventually reaches a climax, and the burst of previously hidden negative news to the public creates an appalling tsunami that greatly damages shareholder value and their confidence in the firm integrity. Researchers commonly focus on firm and managerial characteristics to understand what drives this risk. For instance, Hutton, Marcus, and Tehranian (2009) find a positive association between corporate information opacity and crash risk. Kim, Li, and Zhang (2011b) take a different view and document that aggressive tax strategies encourage managers to amass bad news, leading to a higher likelihood of a stock crash. Kim, Wang, and Zhang (2016) study the personal traits of managers and find that overconfident CEOs could cause stock crashes. Mamun, Balachandran, and Duong (2020) find that overly powerful CEOs increase the risk. Hanlon, Khedmati, Lim, and Truong (2023) find that boardroom backscratching can undermine a board's ability to provide constructive criticism and effective monitoring, increasing the

[1] SEC's 2009 mandate to disclose a firm's efforts to diversify their directors' backgrounds. SEC's 2021 requires board diversity and disclosure.

[2] We focus on independent executive directors. They are independent directors who concurrently hold an executive position at another firm. We consider a person as an executive if the variable, topkeyexecflag, of Capitaliq database equals 1. Examples of these executives are (Co) Chief Executive Officer; Chief Financial Officer; Chief Operating Officer; President; (Co)President.

likelihood of hoarding bad news. Fang, Girardone, Li, and Zeng (2024) underscore the importance of CEOs' general human capital in stock crash risk.

While most of the prior literature examines the drivers of stock crash risk, others have recently started looking for mechanisms to alleviate the risk. Using a gender diversity perspective, Li and Zeng (2019) find that female CFOs play an important role in reducing stock crash probability. Andreou, Antoniou, Horton, and Louca (2016) find that a larger board size reduces the likelihood of a stock crash. Sila, Gonzalez, and Hagendorff (2017) find that independent directors who hold multiple board seats prioritize their monitoring efforts on the boards of larger-sized firms. Additionally, Fang, Pittman, and Zhao (2021) document that the network size of directors can lower stock price crash risk. We extend this line of research by examining whether the primary profession of independent directors can reduce price crash risk.

Fama and Jensen (1983) posit that the supply of monitoring efforts by independent directors is a function of the benefits they derive for their primary profession. Supporting this notion, Boivie, Graffin, Oliver, and Withers (2016) find that by serving as effective independent directors, executives can signal their decision quality to the labor market, which helps them in advancing their careers. Additionally, Duchin et al. (2010) argue that independent directors are also often ineffective because they may lack firm-specific information, and the cost of information gathering may be too high. However, the severity of information cost is likely to be smaller for those independent directors who are active executives of other firms as they tend to have a deep understanding of managers' day-to-day jobs. They can more readily detect whether managers are inflating financial or production numbers to mislead shareholders or spending excess resources on unprofitable pet projects (e.g., Stein and Zhao, 2019; Wang et al., 2015). As a result, we argue that the career-promoting motivation and deep insight into corporate decision-making make independent executive directors well-suited for effectively monitoring managers.

On the other hand, due to similar backgrounds, executives of other firms may not be good monitors of appointing firm's management. Proponents of board diversity argue that directors from similar backgrounds tend to be sympathetic to the management and avoid asking tough questions. Further, sharing similar professional backgrounds with management can subject independent executive directors to groupthink (e.g., Janis, 1972; McCauley, 1989; Faleye, Hoitash, and Hoitash, 2017), making them less likely to challenge the decisions of top managers of the appointing firm. Additionally, if their home firms experience low performance, these directors can be distracted and become ineffective in monitoring managers of firms where they are currently independent directors (Stein and Zhao, 2019). Overall, whether independent executive directors are beneficial in preventing stock crash risk is an empirical question.

Using a large sample of S&P 1500 US public firms from 1996 to 2020[3], we examine whether independent executive directors can protect shareholder value in the context of stock crash risk. We find that the ratio of independent executive directors in a board is negatively associated with stock price crash risk. The presence of at least one independent executive director on a firm's board likely reduces its stock price crash risk between 3.8% to 17%.

While our primary results are robust to different measures of stock price crash risk; inclusion of various firm, CEO, and board characteristics; and also, to the inclusion of industry, year, and firm fixed effects, they could still be endogenously determined. For example, since these directors better understand the internal environment of potential appointing firms, they may choose to serve firms with low stock crash risk. Another endogeneity concern in our empirical setting is the matching between low crash-risk firms with these directors. For example, it is possible that some unobserved factors (e.g., firm culture) maintain a good information environment, discourage managers from hoarding bad news and maintain good governance. The appointment of these directors is a part of that culture. We address these potential endogeneity concerns using four approaches: instrumental

[3] Consistent with prior literature (e.g., Fang et al., 2024), stock crash risk measures are one-year forward, which is from 1997 to 2021.

variable, difference in differences, propensity score matching, Heckman selection, and firm fixed effects.

Our findings reveal that the negative association between independent executive directors and crash risk is stronger in firms with weaker corporate governance. Additionally, these directors help mitigate the adverse effects of CEO overconfidence and managerial option incentives on stock crash risk. Furthermore, firms with a higher proportion of these directors encounter fewer issues with earnings quality and are more likely to oust CEOs responsible for stock crashes.

We investigate the role of career-advancement incentives[4] in shaping the monitoring efforts of independent directors. Due to the lack of a direct measure of these incentives in the literature, we perform a series of regression analyses to isolate their effects. We discover that independent directors who serve as non-CEO executives at other firms outperform independent directors who serve as CEOs at other firms—likely because lower-ranking executives have stronger career-advancement incentives, motivating them to serve as diligent monitors and signal their quality to the labor market. This finding aligns with theoretical and empirical research (e.g., Fama & Jensen, 1983; Boivie et al., 2016). To further support the role of career-advancement incentives, we examine independent retired executive directors[5], who share similar executive skills with independent executive directors but lack the same career-driven motivations (e.g., Cao et al., 2024). Our empirical results indicate that while independent executive directors reduce stock price crash risk, independent retired executive directors increase this risk. The results underscore the significance of career-advancement incentives in influencing the monitoring efforts of independent directors.

This work contributes to literature in several ways. Our paper extends the line of work that focuses on directors' professional backgrounds. Previous literature has examined the presence of

[4] Career-advancement incentives in our paper differ from the reputation incentives as discussed by Sila et al. (2017). In the paper, authors find that directors holding multiple board seats allocate their monitoring efforts based on the reputation of firms where they serve as independent directors. They measure the reputation by the firm's market capitalization. In contrast, our career-advancement incentives focus on the motivation of directors to advance their primary career prospects. This distinction highlights the nuanced factors influencing directors' behavior and decision-making in corporate governance.

[5] An independent retired executive director is defined as an independent director who is retired as indicated in the BoardEx and ISS databases and has prior executive experience.

certain types of directors and their impact on corporate outcomes. These groups include bankers, venture capitalists, politically connected directors, CEO-directors. Byrd and Mizruchi (2005) examine the monitoring role of bankers and find a negative association between the presence of such directors and the debt ratio of appointing firms. Baker and Gompers (2003) study the presence of venture capitalists on the board and find that they lower the bargaining power of CEOs relative to their boards. Goldman, Rocholl, and So (2008) document the value of politically connected directors. While Fich (2005) finds CEO directors are valuable for appointing firms, Fahlenbrach, Low, and Stulz (2010), however, do not find any significant effect of CEO directors relative to other independent directors.

Our work extends the line of research and contributes to the understanding of mechanisms for mitigating stock crash risk. Prior studies link managerial bad news hoarding decisions with firm and managerial characteristics such as CFO option sensitivity (Kim et al., 2011a) and CEO overconfidence (Kim et al., 2016). Li and Zeng (2019) find that a female CFO benefits shareholders in mitigating stock crash risk due to their innate traits. Fang et al. (2021) find that board networks can facilitate information flow among parties and lower the impact of hoarding bad news. We expand the literature on directors' background and board structure by showing that independent executive directors benefit shareholders in the context of stock crash risk. Crucially, we are the first to show that these directors demonstrate a heightened commitment to accountability, with a strong tendency to oust CEOs responsible for stock crashes. Furthermore, our findings carry significant implications for shareholders, emphasizing the value of factoring in career-advancement incentives when structuring the board to enhance effective monitoring.

The paper is organized as follows. In the section 2, we describe our data. In the section 3, we present our main results. In the section 4, we summarize the findings.

2. Sample Data, Key Variables, and Descriptive Statistics:

2.1 Sample Data:

Our sample begins with S&P 1500 firms covered by Institutional Shareholder Services (ISS, formerly Risk Metrics) from 1996 to 2020.[6] We collect background information about whether an independent director is holding top executive positions in other firms from three sources, including ISS, Boardex, Capital IQ People Intelligence, and Execucomp. To form a comprehensive dataset, we match ISS directors, Boardex directors/executives, Capital IQ People Intelligence, and Execucomp executives. From this dataset, we identify those independent directors who currently serve as top executives of other firms.[7]

The data on crash risk measures and other stock-related variables come from CRSP; firm characteristics come from Compustat, and the variables related to CEO characteristics come from Execucomp. Because of the differences in corporate governance and regulation and to be consistent with the previous literature on board structure, we exclude utility and financial firms[8]. Consistent with earlier studies (e.g., Kim et al., 2011a), we remove firm–years with non-positive book values, and low fiscal-year-end stock prices (less than $1). After merging variables from different databases, we obtain a sample of 24,920 firm-year observations of S&P 1500 firms from 1996 to 2020.

2.2 Key Variables

2.2.1 Independent Executive Directors

Our primary variable of interest is Independent Executive Director Ratio (**IE/B**), the number of independent executive directors serving on a board in a given year, scaled by the board size. An independent executive director$_j$ is an independent director of firm j who is serving as a top executive in another firm i. We also use the **IE**, an indicator variable that equals one if a firm has at least one independent executive director and 0 otherwise.

2.2.2 Stock Price Crash Risk

[6] Crash risk measures are from 1997 to 2021.

[7] Boardex and Capital IQ People Intelligence databases contain detailed information about individuals' employment backgrounds. Execucomp covers information on the top five highest-pay executives. After merging individual identifiers among databases, we consider a person as an executive if the variable, topkeyexecflag, of Capitaliq database equals 1. Examples of these executives are (Co) Chief Executive Officer; Chief Financial Officer; Chief Operating Officer; President; (Co)President.

[8] SIC from 4900 to 4999 and from 6000 to 6999

Following prior literature to investigate the effect of independent executive directors on firm future crash risk, we construct three firm-specific measures of stock price crash risk for each firm-year observation (e.g., Hutton et al. 2009; Kim et al., 2011a, b).

- Ncskew: the negative skewness of firm-specific weekly returns over the fiscal year period

$$Ncskew_{j,t} = -\frac{n(n-1)^{3/2}\sum w_{j,\tau}^3}{(n-1)(n-2)\left(\sum w_{j,\tau}^2\right)^{3/2}}$$

  - ✓ n: number of firm-specific weekly returns
  - ✓ $w_{j,\tau}$: firm-specific weekly return, which is equal to $\ln(1+ e_{j,\tau})$ where $e_{j,\tau}$ is the residual from the below regression model of Chen, Hong, and Stein (2001)

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

    - $r_{j,\tau}$ is the return on stock j in week τ, and $r_{m,\tau}$ is the value-weighted market return in week τ

- Duvol: the natural 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

$$Duvol_{j,t} = \ln\left(\frac{(n_u-1)\sum_{Down} w_{j,\tau}^2}{(n_d-1)\sum_{Up} w_{j,\tau}^2}\right)$$

  - ✓ n_u and n_d are the number of up and down weeks, respectively.

- Crash: An indicator variable that equals one if a firm experiences one or more firm-specific weekly returns exceeding 3.20 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise. (Kim et al., 2011a; Li and Zeng, 2019).

2.2.3 Control Variables

Consistent with the previous crash risk literature (e.g., Chen et al., 2001; Hutton et al., 2009; Kim et al., 2016), we control for several factors in our main analyses. Since Chen et al. (2001) find a positive relationship between firms with high intensity of the differences of investor opinion and crash

risk, we use Dturn, which is the difference between the average monthly share turnover over fiscal year t − 1 and the average monthly share turnover over fiscal year t, to proxy for the heterogeneity of investor opinions. To control for the possible persistence of the first moment, second moment, and third moment of stock returns, we include Ncskew, which is the prior stock price crash risk; Sigma, which is the volatility of firm-specific weekly stock returns; and Return, which is the mean of firm-specific weekly stock returns. We follow Kim et al. (2011a) and control for these four observable firm characteristics: firm size, market to book ratio, leverage, and return on assets (ROA). To proxy for the earning management, we use Abacc, which is the absolute value of discretionary accruals. Additionally, we control for CEO influence by adding CEO Tenure measured by the natural log of the number of years a CEO has been in office.

2.3 Descriptive Statistics:

In Table 1, we report summary statistics of crash risk variables, IE/B, IE, and the other variables used in our empirical tests. In our sample, the average values of Ncskew, Duvol, and Crash are 0.11, 0.07, and 0.22, respectively. The means of our crash risk measures are comparable to those reported in previous studies on stock crash risk (e.g., Kim et al., 2011a, 2016; Andreou et al., 2016; Li and Zeng, 2019). 82.4% of firms in our sample have at least one independent executive director. On average, a firm has nine directors[9], of which 23.7% are independent executive directors. These figures align with those reported by recent literature (e.g., Cao et al., 2024; Lawrence, Nguyen, and Upadhyay, 2021; Masulis and Mobbs, 2014; Sila et al., 2017; Stein and Zhao, 2019). The distribution of the other control variables is consistent with those reported in earlier studies.

In Table 2, we present the distribution of the independent executive director ratio (IE/B) by year. From 1996 to 2020, there was an upward trend of firms employing more independent executive directors on their boards. Panel A of Table 3 compares the basic characteristics of independent executive directors and other directors. In general, independent executive directors are younger, have

[9] $e^{2.183} \approx 9$ with 2.183 is the average of ln(board size)

shorter tenure, hold fewer outside board seats, and are less likely to miss board meetings than other types of directors. Panel B of Table 3 shows the univariate analysis of our crash risk measures between two groups of firms defined by the presence of an independent executive director. In general, firms with at least one independent executive director on their board exhibit lower crash risk than firms with no independent executive director. These comparisons give us a preliminary idea that independent executive directors who are younger, have shorter board tenure, and are more prompt in attending board meetings may be driven by their career progression to perform their directorial duties, which likely lowers the stock price crash risk. We test these conjectures in a multivariate setting in the next section.

3. Empirical Analysis

We examine the effects of these differences using the stock price crash risk setting, which is directly influenced by the monitoring efforts of independent directors.

3.1 Independent Executive Director and Stock Price Crash Risk

In Table 4, we investigate independent executive directors' association with the appointing firm's future stock price crash risk. We employ the baseline panel model given below:

$$\text{Crash Risk}_{j,\,t+1} = \beta_1 + \beta_2 * \text{IE/B}_{i,\,t} + \beta_3 * X_{j,\,t} + \lambda_i + \varphi_t + \varepsilon_{j,\,t} \quad (1)$$

- t: year from 1996 to 2020
- Crash $\text{Risk}_{j,\,t+1}$ is measured by one of Ncskew_{t+1} , Duvol_{t+1} , and Crash_{t+1}
- $\text{IE/B}_{j,\,t}$: the number of independent directors, who simultaneously hold an executive positions at other firms, divided by board size
- $X_{j,\,t}$: control variables
- λ_i: Industry fixed effects (two-digit SIC dummies)
- φ_t: time fixed effects (fiscal year dummies)
- $\varepsilon_{j,\,t}$: error term
- Standard errors are clustered at the firm level

Columns 1, 2, and 3 of Table 4 use IE/B as the main independent variable and show the results of equation 1 with three crash risk measures, Ncskew, Duvol, and Crash. The coefficients of IE/B are negative and statistically significant at 1% level across the first three columns in Table 4. These results indicate that firms with more independent executive directors on their boards have significantly lower stock price crash risk. The coefficients of IE/B also indicate a significant economic value of the independent executive directors. For instance, from column 1 of Table 4, a one standard deviation increase in IE/B leads to a 45.90% drop in stock price crash risk as measured by Ncskew.[10] We find similar results in columns 2 and 3 that use alternative measures of stock price crash risk.

In columns 4, 5, and 6 of Table 4, we re-estimate equation 1 with IE, an indicator variable that equals one if a firm has at least one independent executive director and 0 otherwise. Consistent with our primary hypothesis and with the results in the first three columns, the coefficients of the IE are also negative and significant at the 1% level across the last three columns. These results indicate that the presence of at least one independent executive director can significantly lower future firm-specific crash risk.

The signs of coefficients of other control variables are consistent with previous literature. For instance, future stock price crash risk is higher for firms with greater previous year stock return volatility (Sigma), previous year return (Return), and operating performance (ROA) (Li and Zeng, 2019). Dturn and Ncskew also have expected positive signs.

3.2 Endogeneity Concerns

Our results in Table 4 indicate that independent executive directors are associated with lower future stock price crash risk. However, these results could be driven by the endogenous matching of independent executive directors with firms that have lower stock price crash risk. It is plausible that independent executive directors are better informed about the stock price crash risk that firms carry

[10] -0.299*0.175/0.114. -0.299 is the coefficient of *IE/B* in column 1 of Table 4; 0.175 is the standard deviation of *IE/B* in Table 1; 0.114 is the mean of $Nckew_{t+1}$ in Table 1.

and might self-select to serve on such firms' boards. Alternatively, less risky firms may prefer to hire independent executive directors due to some unobservable factors, such as firm culture. Thus, one could question the direction of causality in this relationship between the presence of independent executive directors and stock price crash risk. We use multiple econometric approaches to address these endogeneity concerns.

3.2.1 2-SLS Instrumental Variable (IV) Estimation

In this section, we address the endogenous matching between the low stock price crash risk firms and independent executive directors using an instrumental variable estimation. Executives are the most desirable candidates in the directorial labor market. Firms with lower crash risk may want to hire such highly desirable individuals to serve on their boards. Furthermore, one could also argue that the executives who want to maintain or improve their recognition may like to serve on the board of well-established firms that also have a lower risk of stock crashes. We address these endogeneity concerns using a 2SLS(IV) approach (Staiger and Stock, 1997.) We use Ln(County Supply) as an instrumental variable. County Supply is the total number of firms (excluding the sample firm) in the headquarter county of the sample firm in a given year. We argue that the larger number of firms would raise the supply of executives to serve as independent directors. Knyazeva, Knyazeva, and Masulis (2013) find that firms tend to have over-representation of independent directors drawn from the local pool of director candidates. Similarly, prior literature (e.g., Balsam et al., 2016; Lawrence et al., 2024; Nguyen et al., 2024) examines the choices for board leaders and find that this choice is directly affected by the leadership choices of nearby geographic peers. Thus, the county-based instrument appears to meet both the relevance and exclusion requirements since the local supply of firms affects the frequency of executives at local peer firms who are likely candidates for independent executive directors, but it is unlikely to directly affect the stock price crash risk at the subject firm, except through the effect on independent executive directors. Thus, it would be positively associated with the ratio of

independent executive directors of other firms without affecting the crash risk of the sample firm. Thus, this variable meets the exclusion criterion.

To create this variable, we follow Cao et al. (2024) and first obtain a list of all firms in the Compustat database from 1996 to 2020. We then pull the historical locations of headquarters of those firms from 10-K and DEF 14 Statements in SEC Edgar. After assigning headquarters to counties based on their locations, we calculate County Supply, which is the number of firms in the county of sample firm's headquarter in a given year excluding the sample firm. We use Ln(County Supply), which is the natural logarithm of County Supply, as the instrument, and present two-stage least squares (2SLS) regression analysis in Table 5. Column 1 of Table 5 presents the results of the first stage estimation where the dependent variable is IE/B. The coefficient of Ln(County Supply) is positive and significant at a 1% level. The F-stat of the instrumental variable in the first-stage regressions is 56, which is higher than 10, the threshold suggested by Staiger and Stock (1997). It indicates Ln(County Supply) is a good instrument for the IE/B. After the first stage regression, we obtain Predicted IE/B and include it in columns 2, 3, and 4 of Table 5 (the second stage with different crash risk measures). We continue to find that the coefficients of Predicted IE/B are negative and significant in all the three estimations that use alternative measures of stock price crash risk. These results are again consistent with the notion that the presence of independent executive directors likely reduces stock price crash risk.

3.2.2 Propensity Score Matching (PSM):

The relationship between the presence of an independent executive director and stock crash risk could also be a function of the sample and the selection of firms with such directors. In that case, the relation between independent executive directors and firm crash risk may not be primarily driven by the presence of independent executive directors per se. To mitigate this possibility, we employ a PSM procedure (Rosenbaum and Rubin, 1983) and estimate the treatment effect of the presence of independent executive directors on firm crash risk. We estimate a probit regression where the

dependent variable is IE indicator variable, and control variables are those used in Table 4, including intercept, industry, and time fixed effects. After obtaining the estimated propensity score, we use the nearest neighbor matching approach (1:1) and pair each firm in the control group (firms with no independent executive directors) with each firm in the treatment group (firms with at least one independent executive director). To ensure the balance of the matched sample, we require the caliper to be less than 0.001.

Results from PSM sample analysis are presented in Table 6. In panel A of Table 6, we present a diagnostic analysis evaluating the effectiveness of this matching. The t-statistic values of covariates are consistently less than 1.65, which indicates a good balance of control and treatment groups in the post-matching sample. We run OLS regressions using the matched sample with the same control variables as Table 4 and present the results in panel B of Table 6. The coefficients on IE remain negative and significant across all three columns that use alternative measures of stock price crash risk. These results are consistent with the primary hypothesis found in our baseline regressions in Table 4.

3.2.3 Firm Fixed Effects

If the association between IE/B and stock price crash risk m influenced by unobservable time-invariant characteristics, then any unobserved bias due to latent variables may still affect the coefficient of IE/B. We address the issue of time-invariant unobservable heterogeneity by using firm fixed effects in Table 7. After controlling for unobservable time-invariant factors, the coefficients of IE/B in Table 7 remain negative and significant at 1% level in all three columns thatuse alternative measures of stock price crash risk. These results further support our primary hypothesis that independent executive directors alleviate stock crash risk.

3.2.4 Difference-in-Differences: Departure of independent executive directors Due to Death and Stock Price Crash Risk

Our next approach to address concerns about the direction of causality in the relationship between the presence of independent executive directors and the reduction in stock price crash risk is

to employ a difference-in-differences framework. We use the departure of independent executive directors due to their deaths and identify the effects of losing such directors on future stock price crash risk. Using the Boardex and Audit Analytics announcement data, we identify independent executive directors who passed away in a year t. After identifying those directors, we assign firms into treated and control groups. Treatment firms experience the death of an independent executive director, whereas the control firms experience the death of other directors. Because the death of a director is unexpected, an association between this event and stock price crash risk is likely to be attributed to director's death. Consistent with previous literature (e.g., Li and Zeng, 2019), we examine crash risk three years before and three years after the director's death.

The difference-in-difference regression model:

$$\text{Crash Risk}_{t+1} = \beta_1 + \beta_2 * \text{Post}_{j,\,t+1} + \beta_3 * \text{Treated}_j * \text{Post}_{j,\,t+1} + \beta_4 * X_{j,\,t} + \gamma_j + \varphi_t + \varepsilon_{j,\,t} \qquad (2)$$

- ✓ $\text{Post}_{j,\,t+1}$: an indicator variable that equals one if the observation is from year t and zero otherwise.
- ✓ Treated: an indicator variable that takes a value of 1 if a firm experiences the death of an independent executive director, and zero if a firm experiences the death of other directors.
- ✓ $X_{j,\,t}$: same control variables used in Table 5
- ✓ γ_j: firm fixed effects
- ✓ φ_t: time-fixed effects
- ✓ $\varepsilon_{j,\,t}$: error term

If an independent executive director effectively mitigates firm crash risk, her unexpected departure due to death means less monitoring of managers, which can escalate the future stock price crash risk. To run this analysis, we use the data from Boardex and Audit Analytics from 1996 to 2020 and identify 258 cases of director departures due to death. 56 of 258 departures are of independent executive directors and the remaining 202 are of the non-independent executive directors. We

estimate this hypothesis using all three measures of stock crash risk as a dependent variable and present our results of equation 2 in Table 8. We find that the coefficients of the interaction term, Treated * Post are positive and significant at 1% in the first two columns of Table 8 and at 10% in the 3rd column. These results indicate that firms with an independent executive director experience lower stock price crash risk before the unexpected departure of these directors due to death, but this risk goes up after their death. Overall, this analysis indicates that independent executive directors likely lower a firm's stock price crash risk and that our results are unlikely to be driven by reverse causality.[11]

3.3 When Are independent executive directors More Effective?

3.3.1 Corporate Governance

In this section, we investigate whether the effects of independent executive directors are more pronounced in those firms that need a greater monitoring effort by independent directors. According to agency theory, managerial bad news hoarding activities are more likely to occur when a firm suffers from weak corporate governance systems and poor quality monitoring. Hence, if independent executive directors are indeed helpful in terms of mitigating stock crash risk, we should observe this relation to be stronger for firms with weaker corporate governance. We use E-Index for corporate governance quality. E-Index is the managerial entrenchment index composed of the six most crucial corporate governance provisions (Bebchuk, Cohen, and Ferrell, 2008). A higher E-Index indicates poorer corporate governance.

Like previous literature (e.g., Li and Zeng, 2019), we re-estimate Table 4 with High E-Index[12] and the interaction term, IE/B*High E-Index, and report results in columns 1 to 3 of Table 9. IE/B*High E-Index coefficients are negative and highly significant for all three columns. We also find that IE/B itself is negative and significant at 1% level across all the models, while High E-Index variable is positive and significant across all the models. These results indicate that independent

[11] In an untabulated table, we address potential self-selection bias in the choice of an independent executive director using Heckman Selection Model (Heckman, 1979) and find consistent results.

[12] *High E-Index*: a binary variable equals one if E Index of a firm in a year equals to or above the median of the sample's E-index and zero otherwise.

executive directors lower stock price crash risk in average firms, but this effect is more pronounced in poorly governed firms. Moreover, poorly governed firms are significantly more likely to suffer stock price crash risk.

3.3.2 Independent Executive Directors, CEO Overconfidence and Stock Price Crash Risk

Kim et al. (2016) find that overconfident CEOs tend to overestimate their investment projects or hold negative net present value projects for too long while conveying surreal promises of those projects to shareholders. This behavior leads to a higher crash risk for investors. We hypothesize that independent executive directors are more likely to supply monitoring efforts to evaluate the potential negative effects of overconfident CEOs' pet projects. We follow Kim et al. (2016) to construct the CEO Holder67 variable, which captures CEO overconfidence. To test the hypothesis, we re-estimate our primary models used in the first three columns of Table 4 with CEO Holder67. In columns 4 to 6 of Table 9, we find that the coefficients on the interaction term IE/B*CEO Holder67 are negative and significant at 1% level across all the models. We also find that IE/B itself is negative and significant, while CEO Holder67 variable is positive and highly significant across all the models. These results imply that independent executive directors lower stock price crash risk in average firms, but this effect is more pronounced in firms led by an overconfident CEO who is more likely to adopt policies that allow for hoarding bad news.

3.3.3 Independent Executive Directors, Managerial Option Incentive and Stock Price Crash Risk

Kim et al. (2011) finds that managerial stock option incentives play an important role in stock crash risk. Unlike stock-based compensation, option-based compensation provides managers substantial incentives to pursue high-risk projects at the cost of shareholders. This compensation also incentivizes managers to inflate profitability and/or hide the cost of these projects from shareholders and the board of directors. Monitoring efforts of independent executive directors would become especially important in detecting whether managers are pursuing harmful projects to maximize their

benefit from option-based compensation. We follow Kim et al. (2011) to create CEO Option Incentive and CFO Option Incentive[13]. To test if our results are more pronounced in firms with high CEO and CFO option incentives, we create High CEO Option Incentive (High CFO Option Incentive)[14] and add the interaction terms IE/B*High CEO Option Incentive (IE/B*High CFO Option Incentive) to the original models in Table 4 and present results in Table 10.

We find that the coefficients on the interaction terms IE/B*High CEO Option Incentive and IE/B*High CFO Option Incentive are negative and highly significant across all the models. While the coefficients of IE/B are negative and significant, High CEO Option Incentive and High CFO Option Incentive are positive and significant at 1% level across all the models. These results confirm that the presence of independent executive directors lowers stock price crash risk in average firms, but this effect is more pronounced in firms led by a CEO and CFO who are highly incentivized in a way that encourages them to hoard bad news or report misleading financial results.

3.4 How Do Independent Executive Directors Lower Stock Price Crash Risk?

3.4.1 Audit Committee Membership and Stock Price Crash Risk

In this section, we examine if independent executive directors are beneficial for shareholders if they are serving on audit committees. Bruynseels and Cardinaels (2013) find that even with a fully independent audit committee, CEOs can still have a substantial negative influence on the committee's effectiveness. In columns 1 to 3 of Table 11, we analyze the impact of independent executive directors on stock crash risk based on their involvement as members or chairpersons of the audit committee. In columns 1 to 3 of Table 11, we create Independent Executive Director-Audit Ratio[15], and Independent Executive Director-Non-Audit Ratio[16]. While the coeffiecients of two variables are both negative and highly significant. The magnitude of Independent Executive Director-Audit Ratio's

[13] The definitions are in Appendix A1.
[14] High CEO Option Incentive: a binary variable that equals one if CEO Option Incentive of a firm in a year equals to or above the median of the sample's CEO Option Incentive and zero otherwise.
High CFO Option Incentive: a binary variable that equals one if CFO Option Incentive of a firm in a year equals to or above the median of the sample's CFO Option Incentive and zero otherwise.
[15] the number of independent executive directors serving on the audit committee scaled by board size
[16] the number of independent executive directors not serving on the audit committee scaled by board size

coefficient is significantly higher than Independent Executive Director-Non-Audit Ratio. It implies that more independent executive directors on the audit committees better protect shareholders from stock crashes. In columns 4 to 5 of Table 11, we create Independent Executive Director-Audit Chair, a binary variable that equals one if a firm has an independent executive director serving as an audit committee chairperson and zero otherwise. The interation term bettwen IE/B and Independent Executive Director-Audit Chair is negative and highly significant. The results confirm that independent executive directors are valuable to shareholders when they serve on an audit committee and serve it well to prevent stock crash risk.

3.4.2 Independent Executive Directors and Earnings Reporting Quality

In this section, we continue to examine channels through which independent executive directors might affect the stock price crash risk. In Table 12, we analyze whether the presence of independent executive directors indeed improves audit functions. Consistent with previous literature (e.g., Chang et al., 2017), we use three measures to capture the outcome of independent executive directors on earnings reporting quality: Earnings Restatement, Sudden Release of Unexpected Earnings (SUE), and Earnings Break.

Managers may manipulate earnings reports to gain private benefits at the expense of shareholders. If the negative news accumulation reaches a critical level, managers may not have any room to continue manipulating earnings and are forced to restate earnings. We examine the restatement of earnings in Column 1 of Table 12. The dependent variable is $Restatement_{t+1}$[17], which equals one if the beginning date of a misstatement period falls within fiscal year t+1, zero otherwise. We find that the coefficient on IE/B is negative and significant at 1%. The result indicates that independent executive directors significantly reduce earnings restatements.

[17] We use data on earnings restatements from Audit Analytics, which covers only those events when companies correct their misstated financial statements. We do not consider restatements driven by clerical errors and include only those cases that occur due to the misapplication of accounting rules or financial frauds (e.g., Bens, Goodman, Neamtiu, 2012).

Following Chang et al. (2017), we estimate the sudden release of unexpected earnings (SUE) and include one-year forward SUE, SUE_{t+1}, as a dependent variable in column 2 of Table 12[18]. The coefficient on IE/B is negative and significant at 5%. The result implies that firms with more independent executive directors are less likely to suddenly release negative earnings surprises.

Previous research indicates that managers may have incentives to disclose consecutive rises in earnings, particularly extended sequences of earnings growth. This behavior could result from managers attempting to conceal unfavorable news (e.g., Hutton et al., 2009.) We argue that with higher monitoring efforts of independent executive directors, firms might experience fewer such episodes and are less likely to experience breaks in earnings string in the future. To test this hypothesis, we use Earnings Break[19] (e.g., Krishnamurti, Chowdhury, and Han, 2021) as the dependent variable in column 3 of Table 12. Consistent with the first two columns, IE/B's coefficient is negative and highly significant, suggesting that independent executive directors improve the quality of earnings reports.

Overall, these results are consistent with our hypothesis that independent executive directors are motivated to supply greater monitoring efforts relative to other directors.

3.4.3 Independent Executive Directors and CEO Forced Turnover

Jensen and Murphy (1990) argue that removal from a top executive position is a severe risk for a CEO, whose future employment opportunities are significantly adversely affected. We argue that with greater monitoring efforts, independent executive directors will be more likely to replace CEOs if firms experience stock price crashes. In this section, we empirically investigate whether boards with a higher proportion of independent executive directors are more likely to fire CEOs for higher stock price crash risks. Following previous literature (e.g., Jenter and Kanaan, 2015; Lawrence et al., 2024),

[18] We estimate SUE by: First, we calculate the 'unexpected earnings' of a firm for each year, as defined by the ratio of the change in income before extraordinary items over year t and t-1, scaled by book value at year t-1; Next, we estimate SUE as a dummy variable with the value of one if a firm has unexpected earnings in the bottom decile during year t, but has non-negative unexpected earnings during year t-1, zero otherwise.

[19] Earnings Break is a binary variable that takes a value of 1 if a firm experiences stock price crashes combined with the reduction of earnings in the year t+1 but preceded by an increase of earnings in years t and t-1, zero otherwise.

we employ the following Cox-Hazard model where the dependent variable is a hazard rate for forced CEO turnover:

$$(\text{Forced CEO Turnover} = 1 \mid K_{i,t}) = \Gamma_0 + \gamma_1 * IE/B_t + \gamma_2 * IE/B_t * \text{Crash Risk}_{t-1} + \gamma_3 * \text{Crash Proxy}_{t-1} + \theta_{34} * Y_{j,t} + \gamma_j + \varphi_t + \varepsilon_{j,t} \quad (3)$$

- ✓ Crash Proxy_{t-1}: Ncskew_{t-1}, $\text{Duvol}_{t-1,}$ Crash_{t-1}
- ✓ $Y_{j,t}$: control variables including Ln(Board Size), Ln(CEO Tenure), CEO Compensation, Return, Firm Age, Firm Size, ROA, Leverage, Abacc.
- ✓ γ_j: industry fixed effects
- ✓ φ_t: time fixed effects
- ✓ $\varepsilon_{j,t}$: error term

We obtain the forced CEO turnover data for 1996 to 2000 from Jenter and Kanaan (2015) and for 2001 to 2019 from Peters and Wagner (2014). In Table 13, we estimate three alternative variations of equation 3 using the alternative proxies of stock price crash risk: Ncskew, Duvol, and Crash. We also introduce three interaction terms of these variables and IE/B, including IE/B* Ncskew, IE/B* Duvol, and IE/B* Crash. We find positive coefficients on IE/B that are significant at 1% level across all the models. We also find that the coefficients on interaction terms IE/B * Ncskew, IE/B * Duvol, and IE/B * Crash are also positive and highly significant. In contrast, the coefficients on crash risk variables are insignificant. These results indicate that boards with more independent executive directors are likely to oust CEOs, especially when these CEOs are associated with higher stock price crash risk. Interestingly, the crash risk in itself insignificantly affects CEO turnover, which essentially captures the impact of non-independent executive directors on CEO turnover showing that independent executive directors are better monitors and disciplinarians than the other directors.

3.5 Career-advancement Incentives and Other Robustness Checks

In this section, we investigate the role of career-advancement incentives in shaping the monitoring efforts of independent directors. Due to the lack of a direct measure of these incentives in the literature, we perform a series of regression analyses to isolate their effects. We first compare the effects of independent directors who CEOs and non-CEO executives of other firms. We conjecture that non-CEO executives would have a greater incentive to spend time and effort as independent directors since the outcome of their actions could have a more significant impact on their career advancement. On the other hand, CEOs tend to be busier and less likely to benefit from directorial activities (Fahlenbrach et al., 2010). We re-estimate our primary models used in the first three columns of Table 4 but replace the independent executive director ratio, IE/B, with Non-CEO IE/B and CEO IE/B variables and present results in columns 1, 2, and 3 of Table 14. We find that the Non-CEO IE/B and CEO IE/B coefficients are negative and significant in the three columns. Importantly, the F-test shows that independent directors who are non-CEO executives at other firms dominate independent directors who are CEOs at other firms in alleviating the risk. One key reason explains this finding is that, compared to CEOs, lower-ranking executives possess stronger incentives for career advancement. These incentives drive them to act as diligent monitors when serving on other firms' boards, signaling their high quality to the labor market and thereby advancing their careers. This insight aligns with both theoretical and empirical frameworks in existing research (e.g., Fama and Jensen, 1983; Boivie et al., 2016).

To further support the role of career advancement incentives, we compare the effects of independent executive directors with those of independent retired executive directors in columns 4, 5, and 6 of Table 14. An independent retired executive director is defined as an independent director who is retired as indicated in the BoardEx and ISS databases and has prior executive experience. We note that independent retired executive directors likely possess a similar executive skill set to that of active independent executive directors. However, they differ in motivation, as retired executives are less driven by career advancement (e.g., Cao et al., 2024). Because they lack career advancement

incentives, independent retired executive directors are expected to behave differently from independent executive directors. To test this hypothesis, we include the Independent Retired Executive Director Ratio variable and re-estimate our baseline regressions in columns 4 to 6 of Table 14. We find that while the coefficients on IE/B remain negative and significant at the 1% level, the coefficients on the Independent Retired Executive Director Ratio are positive and highly significant. These results indicate that while independent executive directors reduce stock price crash risk, independent retired executive directors increase this risk. These findings underscore the critical role of career advancement incentives for independent directors and carry significant implications for shareholders, emphasizing the value of factoring in career-advancement incentives when structuring the board to enhance effective monitoring.

Previous literature (e.g., Chee, Matsunaga, and Wang, 2022; Dhaliwal, Naiker, and Navissi, 2010) find directors with strong financial skills improve earnings reports. To ensure our results are not a subset of their findings, we control for the quality of earnings reports, Abacc variable, in all tables. Additionally, in columns 7, 8, and 9 of Table 14, we seperate IE/B into Financial Expert-IE/B and Non-Financial Expert-IE/B[20] and repeat the baseline regressions. We find no significant differences among these groups, indicating that our results are not driven by the financial skills of directors.

4. Conclusion

Stock crash risk can greatly hurt shareholder value and raise the cost of subsequent equity financing. Effective board oversight can restrain such behaviors and mitigate these risks. However, directors need the right motivation and skills to affect these risks effectively. We argue that active executives have the requirements to effectively monitor bad new hoarding behaviors in firms that they are serving as independent directors. Using a large sample of US public firms from 1996 to 2020, we find a statistically and economically significant association between independent executive directors

[20] We obtain the information on financial experts from ISS. The data start from 2007.

and stock price crash risk. We further find that the positive effects of independent executive directors are more pronounced in firms with poor corporate governance, high CEO overconfidence, and high managerial option incentives. Importantly, boards with a higher representation of independent executive directors have a greater tendency to take action and replace CEOs who are responsible for stock price crashes. Additionally, our findings provide a critical insight for shareholders in shaping an effective board of directors: among executives at other firms, non-CEO executives are often the most rigorous independent directors. By prioritizing the selection of these individuals, shareholders can substantially strengthen the monitoring power of the board of directors.

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Table 1: Summary Statistics

This table reports summary statistics of variables used in this paper. IE/B is the number of independent executive directors scaled by board size. IE is the Independent Executive dummy which equals one if a firm has at least one independent executive director and 0 otherwise. Since our regression models use one-year forward crash risk measures, the sample contains firm-year observations from 1997 to 2021 for $Ncskew_{t+1}$, $Duvol_{t+1}$, and $Crash_{t+1}$; and from 1996 to 2020 for other variables. The number of observations, mean, standard deviation, 25th percentile, median, and 75th percentile, are reported from left to right, in sequence for each variable. Detailed definitions of all variables are described in Appendix A.

	Observations	Mean	SD	25th	Median	75th
	(1)	(2)	(3)	(4)	(5)	(6)
$Ncskew_{t+1}$	24920	0.114	0.819	-0.357	0.063	0.516
$Duvol_{t+1}$	24920	0.071	0.510	-0.271	0.055	0.392
$Crash_{t+1}$	24920	0.223	0.416	0.000	0.000	0.000
IE/B_t	24920	0.237	0.175	0.111	0.222	0.364
IE_t	24920	0.824	0.380	1.000	1.000	1.000
$Ln(Board\ Size)_t$	24920	2.183	0.247	2.079	2.197	2.398
$Board\ Independence(\%)_t$	24920	73.054	15.803	63.636	76.923	85.714
$Dturn_t$	24920	0.004	0.088	-0.027	0.002	0.031
$Ncskew_t$	24920	0.126	0.805	-0.341	0.070	0.516
$Sigma_t$	24920	0.045	0.023	0.029	0.039	0.054
$Return_t$	24920	-0.123	0.154	-0.144	-0.076	-0.041
$Ln(CEO\ Age)_t$	24920	4.025	0.128	3.951	4.025	4.111
$Ln(CEO\ Tenure)_t$	24920	1.639	0.933	1.099	1.609	2.303
$CEO\ Holder67_t$	24920	0.493	0.500	0.000	0.000	1.000
$Firm\ Size_t$	24920	7.558	1.459	6.543	7.471	8.561
$Market\ to\ Book_t$	24920	3.766	4.736	1.606	2.494	4.045
$Leverage_t$	24920	0.222	0.169	0.074	0.216	0.335
ROA_t	24920	0.045	0.135	0.021	0.054	0.091
$Abacc_t$	24920	0.045	0.053	0.013	0.030	0.058
$E\ Index_t$	24286	2.529	1.299	2.000	3.000	3.000
$Ln(County\ Supply)_t$	24920	3.724	1.586	2.773	3.871	5.081
$Restatement_{t+1}$	24920	0.059	0.236	0.000	0.000	0.000
SUE_{t+1}	24920	0.069	0.254	0.000	0.000	0.000
$Earnings\ Break_{t+1}$	24920	0.039	0.193	0.000	0.000	0.000

Table 2: Distribution of the Number of Independence Executive Directors/Board Size by Year.

Year	Number of Independent Executive Directors/ Board Size (IE/B) (%)
1996	10.55%
1997	11.37%
1998	12.84%
1999	14.01%
2000	15.41%
2001	16.51%
2002	18.34%
2003	20.04%
2004	21.01%
2005	22.21%
2006	23.29%
2007	26.34%
2008	26.89%
2009	27.36%
2010	27.77%
2011	28.36%
2012	29.09%
2013	29.38%
2014	29.79%
2015	30.04%
2016	30.05%
2017	29.83%
2018	29.71%
2019	30.02%
2020	29.79%

Table 3: Univariate Analysis

This table presents the univariate analysis. Panel A compares the basic characteristics of independent executive directors and other directors. Panel B compares the crash risk measures between a firm with at least one independent executive director and a firm without any independent executive director. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Director Level

	Independent Executive Directors	Other Directors	Difference
	Mean	Mean	
	(1)	(2)	(3)=(2) -(1)
Number of Observations	52,575	156,875	
Ln(Director Age)	4.097	4.104	0.007***
Ln(Director Tenure)	1.961	2.185	0.223***
Ln(1+Number of Outside Board Seats)	0.453	0.458	0.005**
Attendance Problem	0.005	0.016	0.010***

Panel B: Firm Level

	Firms with at least one independent executive director	Firms with no independent executive director	Difference
	Mean	Mean	
	(1)	(2)	(3)=(2) -(1)
Number of Observations	20,544	4,376	
Ncskew	0.104	0.164	0.060***
Duvol	0.064	0.103	0.038***
Crash	0.221	0.232	0.012*

Table 4: Independent Executive Directors and Stock Price Crash Risk

This table reports the multivariate regression results of the impact of independent executive directors on future stock price crash risk. The main independent variables are IE/B, which is the number of independent executive directors scaled by board size, and IE, which equals one if the firm has at least one independent executive and zero otherwise. We use OLS regressions in columns 1, 2, 4, and 5; and a logit regression in columns 3 and 6. The coefficients of the intercept, industry fixed effects, and year fixed effects are not reported for brevity in the respective columns. The standard errors in parentheses are based on standard errors clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$
	(1)	(2)	(3)	(4)	(5)	(6)
IE/B_t	-0.299***	-0.179***	-0.824***			
	(0.035)	(0.022)	(0.109)			
IE_t				-0.062***	-0.038***	-0.173***
				(0.015)	(0.009)	(0.047)
$Ln(Board\ Size)_t$	-0.048*	-0.033*	-0.099	-0.034	-0.025	-0.060
	(0.027)	(0.017)	(0.086)	(0.027)	(0.017)	(0.087)
$Dturn_t$	0.117*	0.068*	0.189	0.115*	0.066*	0.181
	(0.064)	(0.038)	(0.192)	(0.064)	(0.038)	(0.191)
$Ncskew_t$	0.016**	0.005	0.061***	0.016**	0.005	0.062***
	(0.008)	(0.004)	(0.020)	(0.008)	(0.004)	(0.020)
$Sigma_t$	2.476***	1.755***	4.620*	2.440***	1.734***	4.487
	(0.859)	(0.521)	(2.799)	(0.857)	(0.519)	(2.787)
$Return_t$	0.302***	0.203***	0.612	0.298***	0.200***	0.595
	(0.115)	(0.069)	(0.403)	(0.115)	(0.069)	(0.400)
$CEO\ Tenure_t$	-0.006	-0.003	-0.044**	-0.002	-0.001	-0.032*
	(0.006)	(0.004)	(0.017)	(0.006)	(0.004)	(0.017)
$Firm\ Size_t$	0.010**	0.006*	-0.001	0.007	0.004	-0.011
	(0.005)	(0.003)	(0.016)	(0.005)	(0.003)	(0.016)
$Market\ to\ Book_t$	0.008***	0.006***	0.009***	0.008***	0.005***	0.008**

	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)
$Leverage_t$	-0.079**	-0.063***	-0.136	-0.083**	-0.065***	-0.147
	(0.037)	(0.023)	(0.113)	(0.037)	(0.023)	(0.114)
ROA_t	0.162***	0.111***	0.290*	0.173***	0.117***	0.328*
	(0.041)	(0.025)	(0.162)	(0.041)	(0.025)	(0.169)
$Abacc_t$	0.148	0.169***	0.207	0.150	0.170***	0.211
	(0.101)	(0.064)	(0.311)	(0.101)	(0.063)	(0.310)
Pseudo/Adj R-squared	0.022	0.026	0.036	0.020	0.024	0.034
Observations	24920	24920	24920	24920	24920	24920
Industry & Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Instrumental Variable

In column 1, we run an OLS regression with IE/B as a dependent variable. We include Ln(County Supply), other control variables, industry, and year fixed effect in column 1. After the first-stage regression, we obtain Predicted IE/B and include it in the second stage OLS regressions in columns 2, 3, and 4. The coefficients of the intercept, industry fixed effects, and year fixed effects are not reported for brevity in the respective columns. The standard errors in parentheses are based on standard errors clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	IE/B_t	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$
	(1)	(2)	(3)	(4)
Ln (County Supply)$_t$	0.009***			
	(0.002)			
Predicted IE/B_t		-0.863**	-0.426*	-0.417*
		(0.392)	(0.240)	(0.220)
Ln(Board Size)$_t$	-0.009	-0.055**	-0.036**	-0.019
	(0.012)	(0.027)	(0.017)	(0.014)
$Dturn_t$	0.008	0.120*	0.069*	0.038
	(0.011)	(0.064)	(0.039)	(0.032)
$Ncskew_t$	-0.001	0.015**	0.005	0.011***
	(0.001)	(0.008)	(0.004)	(0.004)
$Sigma_t$	0.146	2.622***	1.819***	0.797*
	(0.272)	(0.858)	(0.520)	(0.429)
$Return_t$	0.018	0.317***	0.210***	0.103*
	(0.031)	(0.115)	(0.069)	(0.058)
CEO $Tenure_t$	-0.022***	-0.018*	-0.009	-0.013**
	(0.002)	(0.010)	(0.006)	(0.006)
Firm $Size_t$	0.018***	0.021**	0.011*	0.005
	(0.002)	(0.009)	(0.005)	(0.005)
Market to $Book_t$	0.001***	0.009***	0.006***	0.002***
	(0.000)	(0.001)	(0.001)	(0.001)
$Leverage_t$	0.032**	-0.064*	-0.056**	-0.016
	(0.015)	(0.038)	(0.024)	(0.020)
ROA_t	-0.037***	0.139***	0.100***	0.031
	(0.013)	(0.045)	(0.028)	(0.021)
$Abacc_t$	-0.011	0.142	0.166***	0.031
	(0.024)	(0.101)	(0.064)	(0.054)
Pseudo/Adj R-squared	0.231	0.019	0.023	0.030
Observations	24920	24920	24920	24920
F-stat	55.60	13.33	15.55	14.72
Industry & Year Fixed Effects	Yes	Yes	Yes	Yes
Intercept	Yes	Yes	Yes	Yes

Table 6: Propensity Score Matching

We use all control variables, including year and industry dummies, to match (1:1) firms with at least one independent executive director (treated group) and firms with no independent executive director (control group). Panel A presents the balance tests of treated and control groups. After the matching, we run multivariate regressions like Table 4 with the matched samples. The coefficients of the intercept, industry fixed effects, and year fixed effects are not reported for brevity in the respective columns. The standard errors in parentheses are based on standard errors clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Balance tests of treated and control group

	Mean		T value
	Treated	Control	Treated vs Control
	(1)	(2)	(3)
Ln(Board Size)$_t$	2.175	2.177	-0.300
Dturn$_t$	0.008	0.008	0.200
Ncskew$_t$	0.117	0.133	-0.700
Sigma$_t$	0.044	0.045	-0.420
Return$_t$	-0.120	-0.121	0.200
CEO Tenure$_t$	1.666	1.671	-0.200
Firm Size$_t$	7.449	7.442	0.200
Market to Book$_t$	3.551	3.389	1.450
Leverage$_t$	0.213	0.211	0.410
ROA$_t$	0.046	0.045	0.350
Abacc$_t$	0.046	0.044	1.340

Panel B: Regression results of matched sample

Dependent Variable	Ncskew$_{t+1}$	Duvol$_{t+1}$	Crash$_{t+1}$
	(1)	(2)	(3)
IE$_t$	-0.142***	-0.082***	-0.051***
	(0.029)	(0.018)	(0.016)
Ln(Board Size)$_t$	0.001	0.004	0.017
	(0.072)	(0.046)	(0.039)
Dturn$_t$	0.588***	0.287***	0.167*
	(0.178)	(0.104)	(0.095)
Ncskew$_t$	0.012	0.005	0.008
	(0.020)	(0.012)	(0.010)
Sigma$_t$	-1.304	-0.379	-0.489
	(2.304)	(1.569)	(1.174)
Return$_t$	-0.104	-0.071	-0.036
	(0.299)	(0.225)	(0.146)
CEO Tenure$_t$	-0.014	-0.006	-0.013
	(0.015)	(0.009)	(0.009)
Firm Size$_t$	-0.001	0.002	-0.003
	(0.014)	(0.010)	(0.008)
Market to Book$_t$	0.004	0.003	-0.002
	(0.004)	(0.003)	(0.002)
Leverage$_t$	-0.051	-0.019	-0.002
	(0.109)	(0.068)	(0.057)
ROA$_t$	0.114	0.128	0.029

	(0.137)	(0.088)	(0.088)
$Abacc_t$	-0.295	0.038	-0.135
	(0.261)	(0.170)	(0.141)
Pseudo/Adj R-squared	0.031	0.034	0.033
Observations	4095	4095	4095
Industry & Year Fixed Effects	Yes	Yes	Yes
Intercept	Yes	Yes	Yes

Table 7: Firm Fixed Effects

This table reports the firm fixed effect regression results of the impact of independent executive directors on future stock price crash risk. The main independent variable is IE/B. The coefficients of the intercept, firm fixed effects, and year fixed effects are not reported for brevity in the respective columns. The standard errors in parentheses are based on standard errors clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$
	(1)	(2)	(3)
IE/B_t	-0.614***	-0.401***	-1.696***
	(0.055)	(0.034)	(0.168)
$Ln(Board\ Size)_t$	-0.072*	-0.062**	-0.037
	(0.044)	(0.028)	(0.140)
$Dturn_t$	0.248***	0.146***	0.690***
	(0.067)	(0.040)	(0.212)
$Ncskew_t$	-0.068***	-0.041***	-0.105***
	(0.008)	(0.005)	(0.021)
$Sigma_t$	-1.890*	-0.908	-8.590**
	(1.102)	(0.666)	(3.371)
$Return_t$	-0.073	-0.032	-0.363
	(0.137)	(0.084)	(0.448)
CEO $Tenure_t$	0.001	0.001	-0.018
	(0.008)	(0.005)	(0.023)
Firm $Size_t$	0.131***	0.089***	0.369***
	(0.019)	(0.012)	(0.062)
Market to $Book_t$	0.012***	0.009***	0.017***
	(0.002)	(0.001)	(0.005)
$Leverage_t$	-0.126**	-0.102***	-0.233
	(0.063)	(0.039)	(0.194)
ROA_t	0.215***	0.132***	0.324
	(0.060)	(0.037)	(0.235)
$Abacc_t$	0.043	0.082	-0.165
	(0.117)	(0.073)	(0.359)
Pseudo/Adj R-squared	0.031	0.035	0.036
Observations	24920	24920	22533
Firm & Year Fixed Effects	Yes	Yes	Yes
Intercept	Yes	Yes	Yes

Table 8: Difference in Differences

This table reports the difference-in-difference regression results of the impact of independent executive directors' death on future stock price crash risk. *Treated* is an indicator variable that equals one if a firm experiences a death of an independent executive director and zero if the firm experiences the death of a non-independent executive director. *Post* is an indicator variable that equals one for t+1, t+2, and t+3 and zero for t-1, t-2 and t-3 with t is the year of the event. We include the same control variables as in Table 4. The coefficients of the control variables, intercept, firm fixed effects, and year fixed effects are not reported for brevity in the respective columns. The standard errors are in parentheses and are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	Ncskew	Duvol	Crash
	(1)	(2)	(3)
Post	-0.178	-0.088	-0.410
	(0.118)	(0.067)	(0.292)
Treated * Post	0.397***	0.247***	0.829*
	(0.113)	(0.068)	(0.439)
Ln(Board Size)	0.082	-0.092	0.660
	(0.206)	(0.130)	(0.687)
Dturn	0.424	0.189	1.453
	(0.272)	(0.183)	(0.998)
Ncskew	-0.140***	-0.080***	-0.325***
	(0.031)	(0.019)	(0.091)
Sigma	-0.628	2.632	2.707
	(6.149)	(3.778)	(20.446)
Return	0.753	0.945*	4.007
	(0.844)	(0.539)	(3.460)
Ln(CEO Tenure)	0.005	0.009	-0.066
	(0.037)	(0.022)	(0.124)
Firm Size	0.297**	0.153*	0.723*
	(0.142)	(0.082)	(0.417)
Market to Book	0.014	0.012	0.019
	(0.013)	(0.009)	(0.040)
Leverage	-0.062	0.173	-0.490
	(0.387)	(0.235)	(1.219)
ROA	0.300	0.158	0.976
	(0.201)	(0.171)	(2.020)
Abacc	0.823	0.673*	1.429
	(0.633)	(0.387)	(1.970)
Pseudo/Adj R-squared	0.029	0.049	0.095
Observations	1440	1440	1070
Intercept, Firm & Year Fixed Effects	Yes	Yes	Yes

Table 9: Corporate Governance and CEO Overconfidence

This table reports the relation between independent executive directors, corporate governance, CEO overconfidence and future stock price crash risk. We use the same other control variables as in our baseline regressions in Table 4. The High E-index is a dummy variable that equals one if firm-year observations are equal to or above the median of the sample's E-index and zeroes otherwise. The definition of CEO holder67 is in Appendix A1. We use OLS regressions in columns 1, 2, 4 and 5 and logit regressions in columns 3 and 6. The coefficients of the intercept, industry fixed effects, and year fixed effects are not reported for brevity in the respective columns. The standard errors in parentheses are based on standard errors clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$
	(1)	(2)	(3)	(4)	(5)	(6)
IE/B_t	-0.158***	-0.108***	-0.549***	-0.110**	-0.054*	-0.297**
	(0.049)	(0.030)	(0.166)	(0.045)	(0.028)	(0.142)
High E-Index$_t$	0.088***	0.052***	0.173***			
	(0.019)	(0.012)	(0.063)			
IE/B_t * High E-Index$_t$	-0.263***	-0.135***	-0.492**			
	(0.064)	(0.039)	(0.204)			
CEO Holder67$_t$				0.124***	0.081***	0.300***
				(0.018)	(0.011)	(0.057)
IE/B_t * CEO Holder67$_t$				-0.382***	-0.253***	-1.076***
				(0.060)	(0.037)	(0.192)
Pseudo/Adj R-squared	0.024	0.028	0.036	0.024	0.028	0.037
Observations	24286	24286	24286	24920	24920	24920
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry & Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	Yes	Yes	Yes	Yes	Yes	Yes

Table 10: Managerial Option Incentive

This table reports the relation between independent executive directors, managerial option incentives, and stock price crash risk. The dependent variables are three measures of stock price crash risk: $Ncskew_{t+1}$, $Duvol_{t+1}$, and $Crash_{t+1}$. We use the same other control variables as in our baseline regression in Table 4. We use OLS regressions in columns 1, 2, 4 and 5 and logit regressions in columns 3 and 6. The coefficients of the intercept, control variables, industry fixed effects, and year fixed effects are not reported for brevity in the respective columns. The standard errors in parentheses are based on standard errors clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	CEO			CFO		
Dependent Variable	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$
	(1)	(2)	(3)	(4)	(5)	(6)
IE/B_t	-0.218***	-0.124***	-0.453***			
	(0.047)	(0.029)	(0.147)			
High CEO Option Incentive$_t$	0.103***	0.062***	0.281***			
	(0.018)	(0.011)	(0.056)			
IE/B_t * High CEO Option Incentive$_t$	-0.194***	-0.129***	-0.790***			
	(0.064)	(0.040)	(0.198)			
IE/B_t				-0.209***	-0.123***	-0.492***
				(0.048)	(0.030)	(0.147)
High CFO Option Incentive$_t$				0.099***	0.056***	0.223***
				(0.021)	(0.013)	(0.060)
IE/B_t * High CFO Option Incentive$_t$				-0.224***	-0.133***	-0.677***
				(0.067)	(0.042)	(0.204)
Pseudo/Adj R-squared	0.024	0.027	0.037	0.025	0.028	0.036
Observations	24879	24879	24879	22146	22146	22146
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry & Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	Yes	Yes	Yes	Yes	Yes	Yes

Table 11: Audit Committee Membership and Stock Price Crash Risk

This table reports the relationship between independent executive directors serving on an audit committee and stock price crash risk. Independent Executive Director-Audit Ratio is the number of independent executive directors serving on the audit committee scaled by board size. Independent Executive Director-Non-Audit Ratio is the number of independent executive directors not serving on the audit committee scaled by board size. Independent Executive Director-Audit Chair is a binary variable which equals one if a firm has an independent executive director serving as an audit committee chairperson, and zero otherwise. The data is from 1998 to 2020. The coefficients of the intercept, control variables, industry, and year fixed effects are not reported for brevity. The standard errors are in parentheses and are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$
	(1)	(2)	(3)	(4)	(5)	(6)
Independent Executive Director-Audit $Ratio_t$	-0.392***	-0.234***	-1.061***			
	(0.050)	(0.031)	(0.151)			
Independent Executive Director Non-Audit $Ratio_t$	-0.212***	-0.125***	-0.568***			
	(0.053)	(0.033)	(0.161)			
IE/B_t				-0.167***	-0.088***	-0.514***
				(0.045)	(0.028)	(0.138)
IE/B_t * Independent Executive Director-Audit $Chair_t$				-0.247***	-0.183***	-0.493*
				(0.080)	(0.050)	(0.253)
Independent Executive Director-Audit $Chair_t$				0.012	0.017	-0.024
				(0.030)	(0.018)	(0.091)
Pseudo/Adj R-squared	0.023	0.026	0.036	0.024	0.028	0.036
Observations	23256	23256	23256	23256	23256	23256
F test: *Independent Executive Director-Audit$_t$ - Independent Executive Director -Non-Audit$_t$* = 0	-0.180***	-0.109***	-0.493***			
Intercept, Industry & Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 12: Earnings Reporting Quality

This table presents the relationship between independent executive directors and earnings report quality. The definitions of Restatement, SUE, and Earnings Break are in Appendix A1. We use Logit regression for all columns. The coefficients of the intercept, industry, and year fixed effects are not reported for brevity. The standard errors are in parentheses and are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Independent Variable	Earnings Restatement$_{t+1}$	SUE$_{t+1}$	Earnings Break$_{t+1}$
	(1)	(2)	(3)
IE/B$_t$	-0.444***	-0.331**	-0.847***
	(0.099)	(0.167)	(0.211)
Ln(Board Size)$_t$	-0.039	-0.401***	-0.221
	(0.084)	(0.132)	(0.166)
E Index$_t$	0.015	0.042	0.052
	(0.016)	(0.026)	(0.035)
Big Four$_t$	0.108*	-0.128	0.074
	(0.057)	(0.081)	(0.112)
Ln(CEO Age)$_t$	-0.246**	-0.150	0.096
	(0.119)	(0.197)	(0.251)
CEO Ownership$_t$	0.001	-0.003	-0.010
	(0.003)	(0.006)	(0.008)
CEO Compensation$_t$	-0.057***	0.020	0.008
	(0.021)	(0.029)	(0.044)
Firm Size$_t$	-0.007	-0.001	0.029
	(0.016)	(0.026)	(0.032)
Leverage$_t$	0.286***	1.086***	0.060
	(0.106)	(0.184)	(0.233)
RD Intensity$_t$	-0.514	1.162	-0.935
	(0.324)	(0.721)	(1.038)
ROA$_t$	-0.230**	4.887***	9.211***
	(0.094)	(0.628)	(0.887)
ROA$_{t-1}$	-0.057	1.066**	1.794***
	(0.116)	(0.467)	(0.410)
ROA$_{t-2}$	-0.238**	-2.714***	-0.526***
	(0.115)	(0.536)	(0.201)
Free Cash Flow$_t$	-0.875***	0.371	-4.018***
	(0.209)	(0.520)	(0.702)
Pseudo/Adj R-squared	0.067	0.055	0.069
Observations	23790	23804	23786
Intercept, Industry & Year Fixed Effects	Yes	Yes	Yes

Table 13: Forced CEO Turnover Analysis

This table presents the estimation results of the Cox Hazard model used to predict forced CEO turnover related to stock crash risk. Crash Proxy are $Ncskew_t$, $Duvol_t$, $Crash_t$, for columns 1, 2, and 3, respectively. The coefficients of the intercept, industry fixed effects, and year fixed effects are not reported for brevity in the respective columns. The standard errors in parentheses are based on standard errors clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Independent Variable	$Ncskew_t$	$Duvol_t$	$Crash_t$
Dep. var.=Prob(Forced CEO Turnover) for all columns	(1)	(2)	(3)
IE/B_t	1.057***	1.033***	0.947***
	(0.249)	(0.250)	(0.270)
Crash $Proxy_t$	-0.053	-0.160	-0.103
	(0.097)	(0.157)	(0.173)
IE/B_t * Crash $Proxy_t$	0.654**	1.240***	1.059**
	(0.265)	(0.443)	(0.466)
$Ln(Board\ Size)_t$	0.507**	0.510**	0.508**
	(0.243)	(0.243)	(0.243)
$Ln(CEO\ Tenure)_t$	-0.599***	-0.600***	-0.604***
	(0.056)	(0.056)	(0.056)
CEO $Compensation_t$	-3.979***	-3.976***	-3.992***
	(0.664)	(0.664)	(0.665)
$Return_t$	-1.259***	-1.263***	-1.269***
	(0.165)	(0.164)	(0.165)
Firm Age_t	0.145**	0.145**	0.139**
	(0.066)	(0.066)	(0.067)
Firm $Size_t$	0.006	0.007	0.007
	(0.042)	(0.042)	(0.042)
ROA_t	-0.411***	-0.407***	-0.413***
	(0.111)	(0.111)	(0.111)
$Leverage_t$	0.541**	0.536**	0.541**
	(0.257)	(0.256)	(0.257)
$Abacc_t$	-0.151	-0.139	-0.156
	(0.679)	(0.680)	(0.677)
Pseudo/Adj R-squared	0.052	0.052	0.051
Observations	23763	23763	23763
Industry & Year Fixed Effect	Yes	Yes	Yes
Intercept	Yes	Yes	Yes

Table 14: Robustness Checks

In Columns 1, 2, and 3, we compare the effects of independent directors who CEOs and non-CEOs of other firms. Non-CEO IE/B represents the number of independent directors serving as non-CEO executives at other firms, scaled by board size. CEO IE/B denotes the number of independent directors serving as CEOs at other firms, also scaled by board size. In columns 4, 5 and 6, we compare the effects on stock crash risk between independent executive directors and independent retired executive directors. Independent retired executive directors are independent directors who are retired on Boardex and ISS databases and have executive experience prior to the retirement. Independent Retired Executive Director Ratio equals the number of independent retired executive directors scaled by board size. In Columns 7, 8, and 9, we compare the effect on stock crash risk between independent executive directors who are financial experts and those who are not. Financial Expert-IE/B is the number of independent executive directors who are financial experts, scaled by board size. Non-Financial Expert-IE/B represents the number of independent executive directors who are not financial experts, scaled by board size. We use the ISS variable called "financial expert" to determine if an individual is a financial expert; this data is available starting from 2007. We use the same control variables as in Table 4. The coefficients of the intercept, control variables, industry, and year fixed effects are not reported for brevity. The standard errors are in parentheses and are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$	$Ncskew_{t+1}$	$Duvol_{t+1}$	$Crash_{t+1}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Non-CEO IE/B_t	-0.389***	-0.233***	-1.245***						
	(0.049)	(0.030)	(0.146)						
CEO IE/B_t	-0.197***	-0.118***	-0.342**						
	(0.048)	(0.030)	(0.162)						
IE/B_t				-0.295***	-0.176***	-0.810***			
				(0.035)	(0.022)	(0.109)			
Independent Retired Executive Director $Ratio_t$				0.248**	0.174***	0.725**			
				(0.109)	(0.067)	(0.321)			
Financial Expert-IE/B_t							-0.328***	-0.194***	-0.870***
							(0.076)	(0.047)	(0.227)
Non-Financial Expert-IE/B_t							-0.411***	-0.238***	-1.012***
							(0.054)	(0.033)	(0.155)
Pseudo/Adj R-squared	0.023	0.026	0.036	0.023	0.026	0.036	0.023	0.025	0.044
Observations	24920	24920	24920	24920	24920	24920	14088	14088	14088
F test:									
Non-CEO IE/B – CEO IE/B = 0	-0.192***	-0.115***	-0.903***						
Financial Expert-IE/B_t - Non-Financial Expert-IE/B_t = 0							0.083	0.044	0.142
Control Variables as in Table 4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept, Industry & Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix A1: Definitions

Variable	Definition	Source
Abacc	The absolute value of discretionary accruals, where discretionary accruals are estimated from the modified Jones model (Dechow, Sloan, and Sweeney, 1995).	Compustat
Big Four	A binary variable equals 1 if a firm hire either Deloitte, Ernst & Young (EY), KPMG, or PwC to be its auditor in a year and zeroes othe wise.	Compustat
CEO Option Incentive	The incentive ratio for CEO option holdings, which is calculated as Onepct_Opt/(Onepct_Opt+Salary+Bonus). The variable Onepct_Opt is the dollar change in the value of CEO option holdings resulting from a 1% increase in the firm's stock price (Kim et al., 2011a)	Execucomp
CEO Holder67	We construct CEO Holder67 as follow (Kim, Wang, and Zhang, 2016): ✓ The realizable value per option as the total realizable value of the exercisable options divided by the total number of exercisable options. ✓ The average exercise price of the options by subtracting the realizable value per option from the stock price at the fiscal year-end. ✓ The average percent moneyness of the options is calculated as the per-option realizable value divided by the estimated average exercise price. ✓ CEO Holder67 takes the value of one beginning with the first time the CEO exhibits the below described "behavior" option-holding behavior and zero otherwise. "Behavior": CEOs hold stock options at least twice during our sample period that are more than 67 percent in the money. (Kim, Wang, and Zhang, 2016)	Execucomp
Crash	An indicator variable that equals one if a firm experiences one or more firm-specific weekly returns exceeding 3.20 standard deviations below the mean firm-specific weekly returns over the fiscal year and zero otherwise.	CRSP
Dturn	The difference between the average monthly share turnover over fiscal year T − 1 and the average monthly share turnover over fiscal year T, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding over the month (Kim et al., 2011a).	CRSP
Duvol	The natural logarithm of the ratio of the standard deviation of firm-specific weekly returns for the "down-week" sample to the standard deviation of firm-specific weekly returns for the "up week" sample over the fiscal year (Chen et al., 2001)	CRSP
Earnings Break	A binary variable with the value of one if a firm experiences stock price crashes in the year t+1, and a reduction of earnings in the year t+1 but an increase of earnings in the previous two years.	CRSP, Compustat

E Index	An entrenchment index composed of the six most important provisions in the G-index (Bebchuk et al., 2009)	ISS
Firm Size	The natural logarithm of total sales	Compustat
Independent Executive Director	An independent director who concurrently holds an executive position at another firm. We consider a person as a top executive if the variable, topkeyexecflag, of Capitaliq database equals 1. Examples of these executives are (Co) Chief Executive Officer; Chief Financial Officer; Chief Operating Officer; President; (Co)President.	CapitalIQ, Boardex, ISS.
IE	An indicator variable that equals one if a firm has at least one independent executive director and 0 otherwise	CapitalIQ, Boardex, ISS.
IE/B	The number of independent executive directors divided by board size	CapitalIQ, Boardex, ISS.
Non-CEO IE/B	The number of independent directors serving as non-CEO executives at other firms, scaled by board size.	CapitalIQ, Boardex, ISS.
CEO IE/B	The number of independent directors serving as CEOs at other firms, scaled by board size.	CapitalIQ, Boardex, ISS.
Financial Expert-IE/B	The number of independent executive directors who are financial experts, scaled by board size.	ISS
Non-Financial Expert-IE/B	The number of independent executive directors who are not financial experts, scaled by board size.	ISS
Leverage	The ratio of long-term and short-term debt to total assets measured at the end of the fiscal year	Compustat
Market to Book	The ratio of the market value of equity to the book value of equity measured at the end of the fiscal year	Compustat
Ncskew	The negative coefficient of skewness of firm-specific weekly returns over the fiscal year (Chen et al., 2001).	CRSP
Return	The mean of firm-specific weekly returns over the fiscal year, times 100 (Kim et al., 2011a).	CRSP
$Restatement_{t+1}$	A binary variable equals one if the beginning date of a misstatement period falls within fiscal year t+1 and zero otherwise	Audit Analytics
ROA	The ratio of income before extraordinary items divided by total assets	Compustat
Sigma	The standard deviation of firm-specific weekly returns over the fiscal year (Kim et al., 2011a).	CRSP

Appendix A2: Correlation

This Table presents pairwise correlations between the key variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
$Ncskew_{t+1}$ (1)	1.00													
$Duvol_{t+1}$ (2)	0.90[a]	1.00												
$Crash_{t+1}$ (3)	0.66[a]	0.54[a]	1.00											
IE/B_t (4)	-0.06[a]	-0.05[a]	-0.03[a]	1.00										
$Ln(Board\ Size)_t$ (5)	-0.03[a]	-0.03[a]	-0.03[a]	0.08[a]	1.00									
$Dturn_t$ (6)	0.01[c]	0.02[c]	-0.00	0.00	0.03[a]	1.00								
$Ncskew_t$ (7)	0.03[a]	0.02[b]	0.03[a]	-0.01	-0.03[a]	0.08[a]	1.00							
$Sigma_t$ (8)	0.02[b]	0.03[a]	-0.02[b]	-0.13[a]	-0.30[a]	0.19[a]	0.13[a]	1.00						
$Return_t$ (9)	-0.01	-0.02[c]	0.02[b]	0.10[a]	0.24[a]	-0.19[a]	-0.09[a]	-0.94[a]	1.00					
$Firm\ Size_t$ (10)	-0.01[c]	-0.02[b]	-0.03[a]	0.18[a]	0.58[a]	0.04[a]	-0.02[b]	-0.39[a]	0.31[a]	1.00				
ROA_t (11)	0.03[a]	0.03[a]	0.02[b]	-0.01	0.06[a]	-0.00	-0.03[a]	-0.34[a]	0.37[a]	0.14[a]	1.00			
$Abacc_t$ (12)	0.02[b]	0.03[a]	0.01	-0.05[a]	-0.11[a]	0.03[a]	0.01	0.23[a]	-0.21[a]	-0.12[a]	-0.15[a]	1.00		
$E\ Index_t$ (13)	-0.00	-0.00	0.03[a]	0.25[a]	0.05[a]	-0.01	-0.00	-0.13[a]	0.11[a]	0.04[a]	-0.00	-0.07[a]	1.00	
$Ln(County\ Supply)_t$ (14)	-0.00	0.00	-0.01	0.05[a]	-0.07[a]	-0.01	0.00	0.09[a]	-0.07[a]	-0.03[a]	-0.05[a]	0.05[a]	-0.09[a]	1.00

[c] $p < 0.05$, [b] $p < 0.01$, [a] $p < 0.001$