JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS Vol. 53, No. 6, Dec. 2018, pp. 2685–2719
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doi:10.1017/S0022109018001291

Executive Overconfidence and Securities Class Actions

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Abstract

Overconfident CEOs/senior executives tend to have excessively positive views of their own skills and their company's future performance. We hypothesize that overconfident managers are more likely to engage in reckless or intentional actions/disclosures that give rise to securities class actions (SCAs). Empirical evidence is supportive: Overconfident CEOs/senior executives increase SCA likelihood, though litigation risk is ameliorated through improved governance, such as following the Sarbanes–Oxley Act of 2002. Post-SCA, companies are less likely to hire an overconfident CEO. Following an SCA, overconfident CEOs appear to moderate behavior and to reduce their litigation risk.

I. Introduction

Securities class actions (SCAs) often have significant ramifications for firms and the chief executive officers (CEOs) involved. SCAs, under U.S. Securities and Exchange Commission (SEC) Rule 10b-5, aim to compensate shareholders for

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economic losses caused by a firm's false statements. SCAs often harm companies' product market positions (see, e.g., Karpoff, Lee, and Martin (2008), Johnson, Xie, and Yi (2014)) and their access to capital as per Autore, Hutton, Peterson, and Smith (2014). Given the high stakes, a natural question is whether some types of CEOs are less adept than others in terms of averting SCAs. In particular, are there potentially observable CEO characteristics that imply a greater willingness to inflate their firm's prospects, even if it involves a distortion of facts? A finding that certain types of CEOs are more prone to making erroneous statements and catalyzing a class action could be helpful in terms of selecting new CEOs. Similarly, litigation insurers might wish to identify which executives are riskier and warrant greater pricing scrutiny. We propose one such executive characteristic: overconfidence, which could induce executives to recklessly overstate their prospects or to conceal negative information with a perceived belief that future performance would obviate the economic loss that might otherwise trigger a class action.

Our objective is to better understand the implicit trade-offs and beliefs of CEOs and other executives that could affect the likelihood of SCAs. We analyze the role played by managers' beliefs on litigation risk by focusing on overconfident executives. Our contention is that these executives, with their bullish views about their firm's future prospects, are more likely to engage in manipulative actions. We develop and test hypotheses on the relation between overconfident beliefs and the tendency to commit fraud of the type that leads to SCAs. We also investigate whether SCAs prompt changes in firm policies by either precipitating the CEO's departure from the company or inducing the existing management to improve quality of disclosure. Evidence that SCAs promote disclosure speaks to the policy issue of whether such class actions are welfare enhancing.

Overconfident executives have, by definition, an overly positive view of their ability and of their companies' prospects. This manifests in overconfident executives' making excessively optimistic public statements about the company, or failing to disclose negative information in a timely manner, believing that they might be able to rectify this period of poor performance. Indeed, this is the logic behind the commonly used media-based measures of overconfidence (see, e.g., Hirshleifer, Low, and Teoh (2012)). However, should those statements prove to be falsely optimistic, the company risks becoming subject to a 10b-5 SCA in which shareholders sue for loss or damage arising from reliance on such information when purchasing a company's stock. Exacerbating the risk of a class action lawsuit is that excessive optimism with regard to future performance could leave executives with a nonchalant attitude about shading their financial statements.

We analyze whether, and under what circumstances, overconfident CEOs and non-CEO executives expose their companies to SCAs. For our analysis, we use a firm-year panel data set from 1996 to 2012. We identify SCA events using the Stanford Securities Class Action Clearinghouse.[1] We use option-based measures

[1]In our baseline results, we focus on whether an SCA was filed against a company rather than whether it was ultimately successful. This is because there are many possible reasons for a suit to fail, including the relative quality of the plaintiff's and defendant's lawyers and the resource imbalance between parties fighting the case. In robustness tests, we find qualitatively similar results when focusing on SCAs that were not dismissed.

of overconfidence, focusing on the CEO_HOLDER_67 measure as in Malmendier, Tate, and Yan (2011), which classifies managers as overconfident if they refrain from exercising deep in-the-money (here 67% in-the-money) options. The underlying rationale is that an executive's human capital is often extremely underdiversified (exposed to firm-specific risk). A rational, risk-averse executive would choose not to hold deep in-the-money exercisable options because, strictly speaking, he would be better off liquidating the options and using the funds to create a diversified portfolio with a similar or better risk–return profile but less correlation with his firm-specific risk. We also use an alternative, "trading-based" measure of overconfidence, as in Kolasinski and Li (2013), that classifies CEOs as being overconfident if they purchase stock in their own company and then lose money on the purchase. Additional robustness tests are conducted using a news-based measure of overconfidence.

We first hypothesize and show that overconfident CEOs and executives expose their companies to SCAs. We examine the role of CEO overconfidence within a regression framework similar to that in Kim and Skinner (2012). These regressions use industry fixed effects and year fixed effects, and control for factors that might influence litigation risk.[2] We also check that the results hold when using firm fixed effects and different industry definitions.[3] Our results indicate that overconfident CEOs' firms are about 33% more likely to be subject to an SCA than comparable other firms.[4] Furthermore, the overconfidence of senior executives (excluding CEOs) increases the likelihood of an SCA in addition to the effect of CEO overconfidence. This evidence is consistent with the idea that overconfident executives are also more likely to expose their firms to an SCA by, for instance, making overly positive predictions about the firm's prospects that are not supported by facts.

Next, we analyze the effect of exogenously mandated changes in corporate governance practices in mitigating (or worsening) the impact of CEO overconfidence. We focus on the impact of one such exogenous shock to governance: passage of the Sarbanes–Oxley Act of 2002 (SOX) and contemporaneous changes to the New York Stock Exchange (NYSE)/National Association of Securities Dealers Automated Quotation (NASDAQ) listing rules. We hypothesize and show that improved monitoring following the passage of SOX moderates the impact of CEO overconfidence on SCAs. SOX requires firms to have a majority independent board and fully independent audit and nomination committees, and obliges the CEO to personally sign off on the firm's accounts. These changes are expected to both improve corporate governance standard and expose the CEO to a wider

[2]We use both the 2-digit Standard Industrial Classification (SIC) codes and the Hoberg–Phillips (2016) industry classification to control for industry fixed effects. Hoberg–Phillips industry classification results are provided in the Supplementary Material.

[3]Requiring firm fixed effects significantly reduces the sample size, as many firms are sued only once or are never sued. Consequently, the main reported regressions use industry and year effects.

[4]This result comes from the marginal effects associated with the coefficient on CEO_HOLDER_67 in Table 3 and average litigation risk of 4.5% for nonoverconfident CEOs. The marginal effect associated with CEO_HOLDER_67 in Table 3 is 1.54%, suggesting roughly about $(1.54/4.5) \approx 33\%$ more risk for overconfident managers than for nonoverconfident managers.

range of independent viewpoints (thereby helping moderate overconfident CEOs' views).

To identify the effect of SOX, we distinguish between firms that were compliant with major requirements of SOX before its passage and firms that were not (i.e., noncompliant firms). If additional scrutiny and independent viewpoints mandated by SOX help reign in overconfident senior executives, the passage of SOX should primarily affect firms that were noncompliant at the time and should have little/no effect on firms that were already compliant.

Our empirical findings strongly support our conjecture: In the pre-SOX period, CEO overconfidence has a substantial impact on litigation risk of SOX-noncompliant firms, but it does not affect the litigation risk of SOX-compliant firms. Similarly, in the post-SOX period, noncompliant firms exhibit a significant drop in the effect of CEO overconfidence on firms' litigation risk, whereas there is little change for compliant firms.

We assess whether overconfident CEOs, and companies, modify their behavior in response to SCAs. We hypothesize and show that an SCA reduces the influence of CEO overconfidence on future litigation risk. We also find that post-SCA, these CEOs exhibit fewer indications of being overconfident, relative to their pre-SCA behavior. This finding is consistent with the results in Bernile, Bhagwat, and Rau (2017) that CEOs that experienced extreme shocks in their youth (in that study, natural disasters) were less prone to risk-taking behavior. Further analysis shows that a firm that has been subject to an SCA under its prior CEO is less likely to hire an overconfident executive for its next CEO. These results indicate the potential impact of SCAs (and the threat thereof) in affecting firm and CEO behavior.

We take steps to mitigate econometric concerns that might otherwise influence a study of this type. These include (but are not limited to) the following. As stated, we examine the role of an exogenous event such as SOX in moderating the impact of CEO overconfidence. We also employ measures to address sample selection issues, including propensity score matching techniques. Furthermore, we ensure that the results are robust to alternative measures of managerial overconfidence, including news-based measures, as per Hirshleifer et al. (2012), and trading-based measures, as per Kolasinski and Li (2013). The results are also robust to "adjusting" the overconfidence measure for the firm's stock performance.

The results contribute to the literature in several ways. First, we expand on the SCA literature by highlighting the influence of executives' behavioral characteristics (e.g., CEO overconfidence) on the likelihood of an SCA. Second, we provide additional evidence on the effect of SOX and corporate governance on the impact of CEO overconfidence and the likelihood of SCAs. Third, our results suggest that shocks (e.g., SCAs) can induce CEO behavioral change: CEOs exhibit fewer indications of overconfidence.

The structure of this article is as follows: Section II discusses the literature and presents the hypotheses. Section III describes the data and presents summary statistics. Section IV presents multivariate regression analysis, which examines the relation between executive overconfidence and SCAs. Section V presents robustness tests and addresses alternative explanations for the results, and Section VI concludes.

II. Hypotheses

An SCA arises if the company, or one of its employees, makes a materially falsely positive statement (or omits negative information) and shareholders subsequently suffer loss or damage by relying on this misstatement. The shareholders typically do not need to prove they relied on the misstatement (as the court assumes they relied on the efficiency of the markets, which implicitly impounds all statements relating to the company).[5] Instead, it is generally sufficient for shareholders to prove that there is a false statement and that they purchased the shares after such a false statement. Thus, a 10b-5 SCA typically arises after one of the company's executives makes a positive statement that the company fails to actualize, or presents a positive prediction that fails to materialize. The plaintiff must also establish scienter, which is essentially that the defendant intentionally, or recklessly, misled the market.[6] The following subsections discuss the relation between overconfidence and the likelihood of an SCA.

A. Overconfidence and SCAs in General

We propose that overconfident executives are more likely to make such falsely positive statements. This is for at least 4 reasons. First, as indicated, overconfident CEOs tend to overestimate projects' returns and underestimate projects' risks. Additionally, as stated previously, if the CEO makes a falsely positive statement (i.e., when promoting the firm's projects) and is reckless as to whether that statement is correct, the firm can be held liable for an SCA. Because making imprudently overconfident statements increases the chance of the CEO being found reckless, we expect overconfident CEOs to increase the likelihood of an SCA. Indeed, a track record of overconfident behavior helps establish that the CEO's statements were not merely "negligent" (which is insufficient to establish scienter) but were reckless.[7] We expect this logic to apply similarly to overconfident non-CEO executives.

Second, overconfident CEOs tend to overinvest (Banerjee, Humphery-Jenner, and Nanda (2015), Malmendier and Tate (2005), (2008)). However, such investments often perform poorly (Malmendier and Tate (2008), Kolasinski and Li (2013)), whereupon overconfident managers tend to adopt less conservative accounting practices, postpone loss recognition as per Ahmed and Duellman (2013), and engage in earnings smoothing as per Bouwman (2014) and financial misstatements as per Schrand and Zechman (2012). Furthermore,

[5]This presumption of reliance originated in Basic Inc. v. Levinson (1988). In June 2014, the U.S. Supreme Court upheld the validity of this presumption in Halliburton Co. v. Erica P. John Fund, Inc. (2011).

[6]For a discussion of scienter requirements, see, for example, Bolger (1980). Although the courts initially required the plaintiff to establish that the defendant intentionally misled the market (i.e., by making a statement that she knew to be false), since Ernst & Ernst v. Hochfelder (1976), courts have accepted that it is sufficient to establish that the defendant acted recklessly (Bolger (1980), Walker and Seymour (1998), and Donelson and Prentice (2012)). Furthermore, Donelson and Prentice (2012) argue that Private Securities Litigation Reform Act (PSLRA) is premised on the sufficiency of establishing scienter by showing the defendant CEO was reckless.

[7]Courts have acknowledged that it is difficult to establish direct proof that the CEO intended to mislead or was reckless (Clarke v. United States (1943)). Instead, the court often determines scienter as "a matter of inference from circumstantial evidence" (Herman & MacLean v. Huddleston (1983)).

Laux and Stocken (2012) present a theoretical model in which they argue that optimistic managers are more likely to (potentially inadvertently) misrepresent their investment prospects. Relatedly, McTier and Wald (2011) indicate that overinvestment (albeit not necessarily involving overconfident CEOs) tends to be associated with increased litigation risk.

Third, overconfident CEOs tend to have miscalibrated perceptions of the risk and return associated with investments as per Ben-David, Graham, and Harvey (2013). Thus, overconfident CEOs are more likely to believe (incorrectly) the company will perform well enough that they will not be caught if they make financial misstatements, or even if they are caught, that the firm's stock price will not decline such that shareholders suffer a loss and instigate a Rule 10b-5 suit. Such beliefs appear to prompt overconfident CEOs to produce less conservative accounting statements as per Ahmed and Duellman (2013). Overconfident CEOs also appear to fail to learn from their failure to meet such optimistic forecasts as per Chen, Crossland, and Luo (2015). Thus, the overconfident CEOs' highly optimistic beliefs could result in recklessly optimistic representations as to the firm's future prospects.

Finally, overconfident CEOs are more likely than nonoverconfident CEOs to omit negative information. An SCA can arise following the firm's failure to disclose negative information. Overconfident CEOs, almost by definition, are more confident about their ability to rectify such negative outcomes. Thus, they are slower to recognize negative information, giving rise to SCAs. The foregoing reasons suggest that overconfident CEOs are more likely to make recklessly, or intentionally, falsely positive statements. Such actions expose their firms to SCAs. We expect a similar effect for non-CEO senior executives. Thus we offer the following hypotheses:

Hypothesis 1. Companies with overconfident CEOs are more likely to be subject to SCAs.

Hypothesis 2. Companies with overconfident senior, non-CEO executives are more likely to be subject to SCAs.

B. Governance

Improvements in internal governance should reduce the likelihood that an overconfident CEO's company is sued. Monitoring by independent directors can mitigate the likelihood of securities fraud in general (Choi, Li, and Zhang (2013), Khanna, Kim, and Lu (2015)). Higher quality boards are also associated with improved disclosure quality as per Reeb and Zhao (2013). Our conjecture is that the impact of a CEO's behavioral biases can be attenuated by improving independent oversight and exposing the CEO to a more diverse set of viewpoints. SOX was enacted in response to corporate scandals that connoted both unethical behavior and CEO hubris. The passage of SOX, along with contemporaneous changes to the NYSE/NASDAQ listing rules, represents an exogenous shock to internal corporate governance that imposed requirements such as a majority-independent board and a completely independent audit committee.

There are at least 3 key aspects of SOX that are expected to mitigate the impact of CEO overconfidence on SCA likelihood. First, SOX compels an

overconfident CEO to consider alternative, independent viewpoints when making decisions, thereby moderating her tendency to make reckless statements and investments. Second, SOX increases oversight, creating more checks and balances over financial statements. For instance, Duarte, Kong, Young, and Siegel (2014) argue that SOX reduces managerial discretion, implying that SOX could reduce overconfident CEOs' discretion to act on their biases when making investments. This increase in oversight could, in and of itself, lead to a reduction in misreporting.[8] Finally, SOX forces CEOs to sign off on financial reports, presumably forcing CEOs to reflect more on the company's true financial state. Thus, although there is some evidence that SOX does not per se reduce the likelihood of litigation as per Malm and Mobbs (2014), we expect that it could do so in particular companies, such as those with overconfident CEOs, which could benefit from additional independent oversight and monitoring.

Although SOX's provisions apply to all firms, several firms were already compliant with the major requirements of SOX before its passage, and others were not ("noncompliant" firms). The effect of SOX in reducing the likelihood of overconfident CEOs' companies being sued, therefore, is evident primarily for firms that were not previously compliant.[9] A finding that SOX affects firms that were noncompliant, and not compliant firms, indicates that it was SOX-related requirements that moderated the effects of CEO overconfidence on the likelihood of SCAs.[10] Thus, we state the following hypothesis:

Hypothesis 3. The passage of SOX reduces the likelihood that an overconfident CEO's firm is subject to an SCA, particularly for firms that were not SOX compliant before its passage.

C. Likelihood of SCA Success

It is possible that lawsuits that are brought against firms with overconfident CEOs are of a different quality than those against other firms. For instance, if SCAs are more likely because of a general tendency on the part of an overconfident CEO to paint a more positive picture, rather than actual fraudulent behavior, we would expect many of these lawsuits to be frivolous. If so, this would presumably result in the likelihood of successful SCA litigation being proportionately lower for overconfident CEOs. In contrast, as we hypothesize, if overconfident CEOs are more likely to face SCAs because of a greater tendency to commit securities fraud (advertently or inadvertently), we would expect there to be no substantial difference between the likelihood of a successful SCA when a firm is

[8] Dimmock and Gerken (2015) suggest that improvements in SEC oversight significantly reduced misreporting in the hedge fund sector.

[9] When looking at compliance, we also consider whether the firm complied with both SOX and the NYSE/NASDAQ listing rules, as these were implemented near-simultaneously. We classify a firm as compliant if, in 2000, fewer than 50% of its board members were executives and there were no executives on the audit committee or in the nominating committee.

[10] Although it is worth noting that some aspects of SOX, such as auditors' enhanced responsibilities, CEO certification of financial reports, corporate and criminal fraud accountability, and white collar crime penalty enhancement, affected all (or virtually all) firms. We are not aware of any firms that had explicitly adopted such provisions before SOX, and some, as noted, are changes in legal guidelines. These "unobservable" common factors tend to weigh against finding significant differences between compliant and noncompliant firms.

headed by an overconfident CEO relative to when it is headed by a nonoverconfident CEO. Thus, we state the following hypothesis:

Hypothesis 4. The likelihood that an SCA lawsuit will be successful is independent of a CEO's overconfidence.

D. Post-SCA Learning

We anticipate that an SCA will attenuate the impact of CEO overconfidence on future litigation risk. As we hypothesize earlier, overconfident CEOs are more prone to either failing to disclose negative news or making falsely optimistic statements. We believe that occurrence of an SCA (an impactful shock) helps highlight the importance of adequate and accurate disclosure. Facing a lawsuit could also cause an overconfident CEO to change behavior, even to question the validity of her overconfident beliefs. Consequently, we expect that the occurrence of an SCA will reduce the impact of CEO overconfidence on future litigation risk. Therefore, we state the following hypothesis:

Hypothesis 5. An SCA reduces the impact of CEO overconfidence on future litigation risk.

A related prediction pertains to companies' hiring practices. An SCA can worsen a company's product market position and future access to capital. Thus, we expect a litigated firm to avoid hiring a litigation-prone CEO after it has experienced the effects of an SCA. Accordingly, we expect that a firm that faced an SCA might be inclined to select a more cautious, less overconfident individual for its next CEO. This suggests the following hypothesis:

Hypothesis 6. A company is less likely to hire an overconfident CEO if it was subject to an SCA under its prior CEO.

III. Data

We create a firm-year panel data set to examine the likelihood that a firm is subject to an SCA in a given year. We start with the set of all companies in the Center for Research in Security Prices (CRSP)/Compustat universe. We then match these data with executive-level data from ExecuComp, which we use to identify whether the CEO is overconfident. Data on whether a firm is subject to an SCA are obtained from the Stanford Securities Class Action Clearinghouse. We use CRSP/Compustat data to compute various control variables that the literature has used when examining litigation likelihood (see, e.g., Kim and Skinner (2012)). Relatively few of the firms in our sample are sued more than once. The exact number of repeat defendants varies across model specifications (i.e., with the control variables we require), ranging between 174 and 194 observations out of more than 22,000 firm-year observations involving 1,375 lawsuits from 1996 to 2012.[11] The results are robust to eliminating these repeat SCA targets from

[11] These SCAs, and the conduct relating to them, predate the Concepcion decision (see, e.g., AT&T Mobility v. Concepcion, 563 U.S. 333 (2011)), which upheld the ability of companies to opt out of class actions through arbitration waivers, and the corporate trend to do so (see, e.g., Fitzpatrick (2015)). Thus, this would not bias the results. However, the models do include year effects to control for time-related factors.

the sample.[12] In the reported models, we follow Kim and Skinner (2012) and use firm and 2-digit industry fixed effects. However, we check that the results are robust to using firm fixed effects and alternative industry definitions including the Hoberg–Phillips (2016) industry classifications.

We use option-based and trading-based measures of overconfidence. In robustness tests, we also check that the results are robust to news-based measures of overconfidence. The idea behind option-based measures of overconfidence is that a CEO's personal wealth is underdiversified, with her human capital being tied to the firm. Consequently, a rational CEO would exercise her options when they vest. An overconfident CEO would hold options, especially deep-in-the-money options, for an extended period. We capture this by collecting data on the number and value of the CEO's vested options. We start by constructing the CONFIDENCE measure as "average value per option/average strike price" (Malmendier et al. (2011), Campbell, Gallmeyer, Johnson, Rutherford, and Stanley (2011), and Hirshleifer et al. (2012)), where the average value per option is the total value of the CEO's option holdings (ExecuComp: opt_unex_exer_val) scaled by the number of such options (ExecuComp: opt_unex_exer_num). The average strike price is the firm's stock price at the end of the fiscal year (CRSP: prcc_f) less the value per option.[13] We then construct 2 indicator variables: CONFIDENCE_TOPQ, which is an indicator that equals 1 if the CEO's CONFIDENCE variable is in the top quartile of all CEOs in that year, and CEO_HOLDER_67, which is the Malmendier et al. (2011) CEO_HOLDER_67 measure (computed using publicly available data) and which is an indicator that equals 1 if the CONFIDENCE variable is at least 0.67 on 2 or more occasions (in which case the CEO_HOLDER_67 indicator equals 1 the first time CONFIDENCE is at least 0.67).

We also ensure that the results are robust to using a Kolasinski and Li (2013)–type measure of CEO overconfidence.[14] Kolasinski and Li characterize a CEO as being overconfident if she purchases stock in her own firm and then loses money on the purchase. To construct the measure, we identify all CEO stock purchases in the Thomson Reuters insider trading filings. We determine whether the CEO purchased stock in a particular year and calculate the return the CEO earned on the purchase over the following 2 years (500 trading days). The confidence measure is defined in terms of the return earned on these purchases. This is a continuous variable, where a lower value represents greater overconfidence (i.e., it indicates that the CEO suffered a greater loss after buying the shares). In Figure 1, we depict the start of the class period, end of the class period, and time at which the lawsuit was filed. Additionally, we ensure the results are robust to creating a measure based on the CEO's trading activity in the financial year following the date on which the SCA is filed.

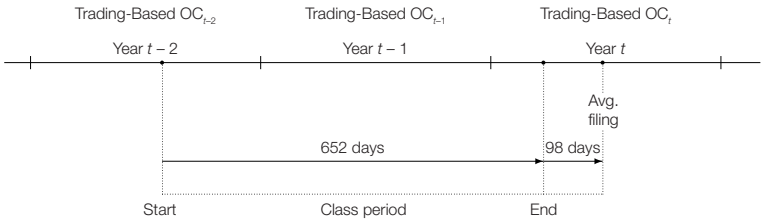
[12] We discuss these results in detail in Section V.

[13] This computation works on the idea that the value per option is roughly $S_t - X$, where S_t is the prevailing stock price at time t and X is the strike price. Thus, the average strike price is roughly $X = S_t - (S_t - X)$.

[14] The correlation between CEO_HOLDER_67 and the trading-based measure is relatively low, at 0.002, which is statistically insignificant. This suggests that the measures capture different aspects of CEO behavior.

FIGURE 1
Time Line of SCA Events and Trading-Based Overconfidence Measure

Figure 1 displays the timing of securities class actions (SCAs). OC stands for overconfidence.



The sample composition by year is provided in Table 1. The table indicates that the sample size is relatively stable over time. Approximately half of the CEOs in the sample are overconfident (i.e., have CEO_HOLDER_67 equal to 1). This is similar to the proportion of overconfident CEOs in prior studies using this measure (Malmendier and Tate (2005), (2008), Malmendier et al. (2011)). Around 65% of all lawsuits involve overconfident CEOs (i.e., if the company is sued, it is around 1.8 times as likely that the CEO is overconfident than nonoverconfident). The proportion of suits that involve overconfident CEOs fluctuates over time.

TABLE 1
Sample Distribution by Year

Table 1 presents sample composition by year. We define overconfident (OC) chief executive officers (CEOs) as those for which CEO_HOLDER_67 equals 1 (CEO_HOLDER_67 is defined in the Appendix), and 0 otherwise. We identify lawsuits using the Stanford Securities Class Action Clearinghouse.

Year	No. of CEOs	No. of OC CEOs	No. of Lawsuits Filed	No. of OC CEOs Involved in Lawsuits	% of Lawsuits Involving OC CEOs
1996	1,125	505	14	9	64.286
1997	1,135	578	38	29	76.316
1998	1,183	676	57	46	80.702
1999	1,234	720	93	65	69.892
2000	1,300	742	105	78	74.286
2001	1,355	786	129	98	75.969
2002	1,339	746	124	81	65.323
2003	1,384	715	119	81	68.067
2004	1,419	763	111	73	65.766
2005	1,395	803	87	52	59.770
2006	1,378	796	76	46	60.526
2007	1,398	798	104	63	60.577
2008	1,509	805	99	53	53.535
2009	1,498	731	71	37	52.113
2010	1,475	691	73	37	50.685
2011	1,417	676	48	23	47.917
2012	1,329	631	27	17	62.963
Total	22,873	12,162	1,375	888	64.582

Summary statistics are reported in Table 2.[15] We report statistics for the full sample and for the subsamples of companies run by overconfident CEOs. The summary statistics are relatively standard and in line with expectations. There is a

[15]In the Supplementary Material, we report summary statistics for additional variables that are used but are not central to our analysis (e.g., see Table OA1).

TABLE 2
Summary Statistics

Table 2 presents the summary statistics. Variable definitions are in the Appendix. CEO is chief executive officer and CAR is cumulative abnormal return.

	Full Sample			Overconfident CEOs			Nonoverconfident CEOs		
Variable	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Panel A. Litigation Variables									
SUED	0.060	0.238	0.000	0.073	0.260	0.000	0.045	0.208	0.000
Long-run return of sued firm CAR(+10,+360) (%)	−28.431	221.691	−14.998	−37.041	161.524	−20.723	−18.722	273.812	−9.339
Prerunup return of sued firm CAR(−360,0) (%)	−34.980	256.839	−19.751	−35.854	188.056	−19.691	−33.996	316.958	−19.765
Panel B. Confidence Measures and CEO Characteristics									
CEO_HOLDER_67	0.532	0.499	1.000						
TEAM_HOLDER_67	0.789	0.408	1.000						
SENIOR_EXECUTIVE_HOLDER_67	0.786	0.411	1.000						
JUNIOR_EXECUTIVE_HOLDER_67	0.667	0.471	1.000						
CEO_STOCK_INTENSITY	0.131	0.202	0.000	0.118	0.198	0.000	0.147	0.205	0.000
CEO_OPTION_INTENSITY	0.300	0.272	0.261	0.327	0.287	0.294	0.269	0.251	0.232
CEO_PCT_SHARES_OWNED	0.018	0.038	0.003	0.022	0.041	0.005	0.013	0.034	0.002
CEO_AGE (years)	60.770	8.706	61.000	61.396	8.427	61.000	60.056	8.958	60.000
CEO_TURNOVER (in $t+1$ and $t+2$)	0.071	0.257	0.000	0.065	0.256	0.000	0.078	0.269	0.000
INTERNAL_CEO indicator	0.311	0.463	0.000	0.316	0.465	0.000	0.306	0.461	0.000
FEMALE_CEO indicator	0.019	0.138	0.000	0.012	0.110	0.000	0.028	0.164	0.000
NET_NEWS	3.089	2.260	2.817	4.075	2.210	4.221	1.754	1.521	1.503
Panel C. Firm Variables									
ASSETS ($mil)	8,695.599	20,992.480	1,679.331	8,088.222	19,834.200	1,560.185	9,384.651	22,214.420	1,841.269
INSIDER_HOLDING	0.016	0.053	0.002	0.018	0.054	0.003	0.014	0.051	0.001
INST_OWN	0.552	0.560	0.640	0.569	0.529	0.671	0.532	0.594	0.608
MB	3.209	3.652	2.204	3.715	3.924	2.647	2.630	3.219	1.843
PPE	0.262	0.230	0.192	0.245	0.228	0.173	0.281	0.232	0.219
RETURN_($t-1$)	−0.001	0.037	0.000	0.003	0.038	0.003	−0.006	0.036	−0.004
RETURN_STD_DEV_($t-1$)	0.107	0.071	0.090	0.109	0.072	0.092	0.105	0.070	0.087
ROA	0.032	0.138	0.044	0.047	0.120	0.055	0.014	0.154	0.033
RD	0.030	0.064	0.000	0.032	0.066	0.000	0.028	0.062	0.000
SALES_GROWTH	0.071	0.213	0.053	0.101	0.212	0.076	0.036	0.209	0.030
TURNOVER_($t-1$)	2.042	2.164	1.453	2.276	2.448	1.637	1.777	1.749	1.262

significant negative stock price decline before the announcement of an SCA. The decline is more severe for companies run by overconfident CEOs. Overconfident CEOs' companies are also more likely to be sued and to suffer more negative long-run post-SCA returns. There are some differences between overconfident CEOs' firms and nonoverconfident CEOs' firms. In robustness tests (discussed in Section V), we take steps to mitigate any concern that the results merely reflect systemic differences between overconfident CEOs' firms and nonoverconfident CEOs' firms.

IV. Analysis

This section presents the multivariate regression analysis. We begin by analyzing the relation between CEO and non-CEO executive overconfidence and SCAs. Next, we explore how governance, entrenchment, and CEO compensation affect the relation between overconfidence and SCAs, with improved governance mitigating the impact of CEO overconfidence. Finally, we explore whether overconfident CEOs are more likely to be disciplined (as proxied by them leaving the company) following an SCA.

TABLE 3
Effect of CEO Overconfidence on SCAs

Table 3 presents models that analyze the relation between chief executive officer (CEO) overconfidence and the likelihood of a securities class action (SCA). The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t. CEO_HOLDER_67 and CEO_TRADING_BASED_OC are 2 measures of CEO overconfidence. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: SCA Indicator	
Variable	Model 1	Model 2
CEO_HOLDER_67	0.278***	
	[0.100]	
CEO_TRADING_BASED_OC		−0.465***
		[0.076]
NYSE_($t-1$)	−0.108	−0.365**
	[0.125]	[0.172]
ln(ASSETS_($t-1$))	0.381***	0.518***
	[0.044]	[0.050]
ROA_($t-1$)	0.527	0.502
	[0.349]	[0.404]
SALES_GROWTH_($t-1$)	1.236***	1.145***
	[0.213]	[0.299]
RD_($t-1$)	1.564	1.187
	[0.994]	[0.963]
PPE_($t-1$)	−1.279***	−0.579
	[0.380]	[0.463]
MB_($t-1$)	0.053***	0.029***
	[0.008]	[0.010]
RETURN_($t-1$)	−6.162***	−3.102**
	[1.321]	[1.456]
SKEW_($t-1$)	−0.083	−0.132
	[0.066]	[0.083]
RETURN_STD_DEV_($t-1$)	2.440**	2.287***
	[1.119]	[0.783]
TURNOVER_($t-1$)	0.091***	0.046
	[0.019]	[0.034]
INST_OWN_($t-1$)	0.202***	0.423***
	[0.067]	[0.146]
EQUITY_PROCEEDS_($t-1$)	1.774***	2.451***
	[0.513]	[0.418]
DEBT_PROCEEDS_($t-1$)	−0.064	−0.208
	[0.234]	[0.316]
INSIDER_TRADING_($t-1$)	0.092	−0.131
	[0.473]	[0.366]
INSIDER_HOLDING_($t-1$)	−2.818*	−3.148**
	[1.513]	[1.317]
IND_WC_($t-1$)	0.019	0.052
	[0.019]	[0.039]
IND_ALTMAN_Z_($t-1$)	−0.001	−0.002
	[0.001]	[0.002]
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
No. of obs.	19,074	10,036
Pseudo-R^2	0.133	0.179

A. Executive Overconfidence and the Likelihood of an SCA

We begin by testing the hypothesis that overconfident CEOs' firms are more likely to be sued. We analyze the relation between CEO overconfidence and litigation likelihood in Table 3. The control variables are based on the models in

Kim and Skinner ((2012), tables 7 and 8).[16] All controls are 1-period lagged.[17] The regression models in Table 3, and in subsequent tables, are logit regressions with year and SIC 2-digit industry fixed effects as per Kim and Skinner. The year fixed effects mitigate the impact of legal changes over time, such as PSLRA, that can influence SCA likelihood (see, e.g., Choi, Nelson, and Pritchard (2009)). The industry fixed effects help to address prior evidence that industry conditions can influence fraud propensity (see, e.g., Wang, Winton, and Yu (2010), Wang and Winton (2014)). If we use year and firm fixed effects we obtain qualitatively similar results to those in Table 3. This suggests that our results are not merely capturing a time-invariant "firm" effect and that changing the level of CEO overconfidence at a given firm can affect SCA likelihood.[18]

The important finding in Table 3 is that CEO overconfidence is significantly and positively related to the likelihood of the company being sued, supporting Hypothesis 1. This result is economically significant. Using the marginal effect of 1.54% associated with CEO_HOLDER_67 in column 1 of Table 3 and 4.5% average litigation risk for nonoverconfident CEO-led firms in Table 2, we find that overconfident managers are 33% more likely to be sued than are otherwise similar nonoverconfident CEOs. We find similar results when focusing on the trading-based measure of overconfidence as in Kolasinski and Li (2013) measure of overconfidence in column 2 of Table 3.

The coefficients on the control variables are largely consistent with expectations and with the literature (see, e.g., Kim and Skinner (2012), Choi (2006), and Field, Lowry, and Shu (2005)). Insider trading is not significantly related to SCA likelihood. This is consistent with prior findings that there is little abnormal insider trading before SCAs as per Niehaus and Roth (1999). Institutional ownership is positively related to SCA likelihood. This likely reflects the role of institutional investors in monitoring firms (and disciplining firms for misconduct), especially in light of SCA reforms that emphasize the presence of a lead plaintiff (i.e., an institutional investor) to pursue the case (as in Perino (2012), (2014)). It is also consistent with evidence that some institutional shareholders tend to face lower costs in pursuing litigation as per Choi, Johnson-Skinner, and Pritchard (2011). Firms that raise equity are more likely to be sued. This is unsurprising given the evidence on litigation around equity issuance. Firms with lower and more volatile stock returns are more likely to be sued (as in Jones and Weingram (1996), Choi (2006), Gande and Lewis (2009), and Arena and Julio (2015)). This is consistent with the idea that a 10b-5 case will be successful only if the shareholders suffered a loss after they purchased the stock.

Corporate fundamentals are also related to litigation likelihood. Larger firms are more likely to be sued, possibly because larger firms have more assets with which to satisfy any litigation award. Similarly, firms with higher return on

[16] Alternatively, we use the Hoberg–Phillips (2016) industry classification and obtain results that are almost exactly the same. We provide these results in the Supplementary Material.

[17] The core results are robust to using twice-lagged controls.

[18] However, using the firm fixed effect instead of industry fixed effect causes our sample size to shrink to only 5,000 observations (from around 20,000) as many companies never experience an SCA, and many companies experience only 1 SCA. Hence, for most of our analysis we rely on the industry fixed effect.

assets (ROA) and sales growth (SALES_GROWTH) are more likely to be sued, which is in line with evidence that large cash holdings can render firms vulnerable to litigation-like disputes with unions (see, e.g., Arena and Julio (2015), Klasa, Maxwell, and Ortiz-Molina (2009)). Conversely, higher levels of plant, property, and equipment (PPE) reduce SCA likelihood (after controlling for the firm's asset size). This could reflect the fact that PPE cannot be easily converted into cash to meet a litigation payout, making the company a less attractive target.

We next examine the relation between non-CEO executive overconfidence and the likelihood of an SCA in Table 4. We analyze the overconfidence of all executives in a firm in the ExecuComp database: senior executives and junior executives. In each case, we construct our option-based and trading-based measures of overconfidence for the firm's executives in ExecuComp. We report several findings: First, under both the option-based and trading-based measures of overconfidence, executive overconfidence is significantly associated with litigation risk; that is, CEO_HOLDER_67 is significant and positive, whereas the trading-based measure is statistically significant and negative. Second, this effect seems to concentrate in the senior executives and the CEO: In regressions that include CEO (and/or senior executive) overconfidence, junior overconfidence is found to be statistically insignificant, indicating that junior executives' overconfidence is not the primary driver of litigation risk. Overall, the results on senior executives' behavioral attributes and litigation risk support Hypothesis 2.

TABLE 4
Effect of Team Overconfidence on SCAs

Table 4 presents models that analyze the relation between top managers' (team) overconfidence and the likelihood of a securities class action (SCA). The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t. CEO_HOLDER_67 and CEO_TRADING_BASED_OC are 2 measures of chief executive officer (CEO) overconfidence. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Model (Dependent Variable: SCA Indicator)									
Variable	1	2	3	4	5	6	7	8	9	10
TEAM_HOLDER_67	0.483*** [0.171]									
SENIOR_EXECUTIVE_ HOLDER_67		0.502*** [0.173]		0.781*** [0.268]						
JUNIOR_EXECUTIVE_ HOLDER_67				−0.297* [0.171]	−0.134 [0.159]					
CEO_HOLDER_67			0.278*** [0.100]		0.308** [0.139]					
TEAM_ TRADING_BASED_OC						−0.460*** [0.054]				
SENIOR_EXECUTIVE_ TRADING_BASED_OC							−0.455*** [0.059]		−0.423** [0.174]	
JUNIOR_EXECUTIVE_ TRADING_BASED_OC									−0.014 [0.169]	−0.063 [0.203]
CEO_TRADING_BASED_OC								−0.465*** [0.076]		−0.359* [0.204]
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	19,067	19,056	19,074	10,241	10,252	24,006	18,526	10,036	6,636	4,087
Pseudo-R^2	0.134	0.134	0.133	0.145	0.142	0.170	0.175	0.179	0.205	0.225

B. SOX, CEO Overconfidence, and the Likelihood of an SCA

We test the hypothesis that SOX ameliorates the impact of managerial overconfidence on SCA likelihood (Hypothesis 3). For these tests, we focus on the option-based measure of overconfidence. We do not use the trading-based measure because the small sample size hinders reliable estimation. Requiring board data on whether the firm was SOX-compliant and restricting the analysis to the years around SOX reduce the sample size substantially. The sample is further restricted for the trading-based measure, resulting in relatively few cases in which we can identify compliance with SOX and have data on CEOs' trading activities with which to detect CEO overconfidence.

We start by interacting the option-based measure of overconfidence with a POST_SOX indicator that equals 1 if the observation occurs in 2002 or later, and 0 otherwise. When examining SOX, we restrict the sample to 6 years on either side of SOX (i.e., 1996–2008). We use a post-SOX indicator in addition to splitting the sample by whether the firm was previously compliant with SOX's governance provisions. This is because SOX could enhance governance even in compliant firms by (inter alia) requiring CEOs to personally sign off on financial reports, increasing audit stringency, and enhancing internal controls (see, e.g., Arping and Sautner (2013)).[19] We define a company as compliant if, in 2000, it had a majority nonexecutive board and had no executives on its audit and nominating committees.

The results are reported in Table 5. In column 1, the interaction terms of the post-SOX dummy with the overconfidence measures are negative and statistically significant. In columns 2 and 3, we analyze the subsamples of firms that were SOX compliant and those that were not.[20] We find that the interaction term is negative and significant only for the noncompliant subsample. The difference between the coefficients on the interaction term between the compliant and noncompliant subsamples is statistically significant. For the noncompliant firms, the improvement in the impact of overconfidence is economically meaningful: Before SOX, in noncompliant firms, overconfident CEOs increased litigation risk by only 2.4 percentage points (from a sample average of around 6 percentage points). After SOX, the impact of overconfidence increased by 2.1 percentage points, suggesting overconfidence only increased litigation risk by 0.3 percentage points, in this sample, after SOX. This suggests that SOX mainly affected the firms that were not previously compliant with its major provisions, consistent with Hypothesis 3.

Although smaller firms were exempt from SOX, this is unlikely to bias our results because our sample comprises only ExecuComp (i.e., Standard & Poor's (S&P) 1500).[21] Further, the SOX results are unlikely to merely reflect an increase in litigation following the dot-com crash: the reported models include industry

[19] For example, related work indicates that SEC oversight significantly improved hedge fund governance and reporting as per Dimmock and Gerken (2015).

[20] We focus on analyzing subsamples, rather than triple interactions, because of the difficulties interpreting triple interactions in logit models. The subsample analysis also allows that the coefficients on the controls vary across subsamples, mitigating any confounding effect from differential impacts of controls.

[21] For example, the exemption from Section 404(b) of SOX applies only to companies with a market capitalization of less than $75 million.

TABLE 5
Effect of SOX on the Relation between CEO Overconfidence and SCAs

Table 5 presents models that analyze the effect of the Sarbanes–Oxley Act (SOX) on the relation between chief executive officer (CEO) overconfidence and the likelihood of a securities class action (SCA). The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t. We define 1996–2002 as the pre-SOX period and 2003–2008 as the post-SOX period. We define SOX-compliant firm as a firm that had a 100% independent nominating committee, 100% independent audit committee, and majority independent board. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: SCA Indicator		
	All	Compliant	Noncompliant
Variable	1	2	3
CEO_HOLDER_67	0.501***	0.393	0.538***
	[0.173]	[0.435]	[0.202]
CEO_HOLDER_67 × POST_SOX	−0.355*	0.430	−0.494**
	[0.210]	[0.526]	[0.237]
POST_SOX	−0.089	0.470	−0.107
	[0.360]	[0.690]	[0.391]
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
No. of obs.	12,208	1,847	10,127
Pseudo-R^2	0.140	0.369	0.129
Difference between coefficient associated with CEO_HOLDER_67 × POST_SOX between compliant and noncompliant samples			
χ^2 value	3.50		
p-value	0.061		

and year fixed effects and we obtain qualitatively similar results (unreported) if we exclude "high tech" firms or IT firms, following the definition in Loughran and Ritter (2004).

C. Likelihood of Successful SCAs

One concern is that an overconfident CEO, who makes many positive comments, is an easy target for a frivolous/nonmeritorious SCA. We mitigate this concern by hand collecting data (from the Stanford Securities Class Action Clearinghouse) on whether the litigation is found in favor of the plaintiff or the defendant (i.e., the company). For our test, we focus on the sample of firms that are already subject to SCAs. The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t and the SCA results in a successful litigation in the future, and 0 otherwise. The results are in Table 6. We find that the coefficient on CEO_HOLDER_67 is not statistically significant, suggesting that there is no significant difference in the nature of the SCAs faced by overconfident CEOs, as reflected by the likelihood of success.

The results in Table 6 suggest that frivolous lawsuits do not drive our results. Furthermore, we ensure that our baseline results are robust to excluding any SCA that is unsuccessful (and treating such firms as if they never had an SCA). This robustness test is premised on the assumption that all failed SCAs are frivolous. We also find in Table 7 that the core results hold even if we replace the SCA indicator with an indicator that equals 1 if the firm is exposed to an ultimately successful lawsuit, and 0 otherwise (i.e., if it is exposed to an unsuccessful suit or no suit).

TABLE 6

Effect of CEO Overconfidence on the Likelihood of Successful SCAs

Table 6 presents models that analyze whether a securities class action (SCA) occurs, the likelihood that the SCA is successful. This sample includes only sued firms (i.e., observations associated with an SCA). The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year *t* and the SCA results in successful litigation in the future. CEO_HOLDER_67 and CEO_TRADING_BASED_OC are 2 measures of CEO overconfidence. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets).

	Dependent Variable: Likelihood of a Successful SCA	
Variable	1	2
CEO_HOLDER_67	0.088 [0.236]	
CEO_TRADING_BASED_OC		−0.252 [0.165]
Controls	Yes	Yes
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
No. of obs.	1,028	331
Pseudo-R^2	0.170	0.251

TABLE 7

CEO Overconfidence and Successful SCAs

Table 7 presents models that analyze the relation between chief executive officer (CEO) overconfidence and successful securities class actions (SCAs). In the models, the SCA indicator is replaced with an indicator that equals 1 if the firm was subject to an SCA that turned out to be successful, and 0 otherwise (i.e., either an unsuccessful SCA or no SCA). Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). ** indicates significance at the 5% level.

Variable	Dependent Variable: Successful SCA Indicator
CEO_HOLDER_67	0.299** [0.152]
Controls	Yes
Industry fixed effects	Yes
Year fixed effects	Yes
No. of obs.	16,588
Pseudo-R^2	0.097

D. Post-SCA Learning by CEOs

We expect that an SCA will reduce the impact of CEO overconfidence on future litigation risk. We expect this because the occurrence of an SCA could impress upon an overconfident CEO the need to engage in adequate disclosure and moderate her tendency to make excessively optimistic statements about future prospects. We test this by analyzing the likelihood that firms with overconfident CEOs face additional SCAs after their first SCA. This likelihood is compared to the likelihood of the firm being sued for the first time. We assess whether the impact of CEO overconfidence on litigation risk reduces after the first SCA. In unreported robustness tests, we ensure that the results are qualitatively similar if we require the CEO be with the firm for at least 2, 3, or 4 years after the firm faces initial SCA, thereby mitigating the concern that the only reason overconfident CEOs appear less likely to face SCAs is because they are fired and drop out of the sample.

The results are reported in Table 8 and suggest that an SCA reduces the likelihood that an overconfident CEO is sued again. We analyze the impact of overconfidence on future litigation risk by looking at the impact of overconfidence on i) the likelihood of a first SCA (models 2 and 4) and ii) the likelihood of a second SCA given that the firm has already experienced an SCA in the past (models 1 and 3). We find that whereas overconfidence is statistically significantly associated with litigation risk for the firms that have never faced an SCA, it is not significantly related to litigation risk for the firms that have already been sued.[22] This implies that an SCA helps reduce future litigation risk in firms led by overconfident CEOs.

TABLE 8
CEO Overconfidence and Likelihood of Future SCAs

Table 8 presents models that analyze the relation between chief executive officer (CEO) overconfidence and repeat securities class actions (SCAs). The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t. CEO_HOLDER_67 and CEO_TRADING_BASED_OC are 2 measures of CEO overconfidence. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). ** indicates significance at the 5% level.

Variable	Sued Before Model 1	Never Sued Model 2	Sued Before Model 3	Never Sued Model 4
CEO_HOLDER_67	−0.263 [0.175]	0.312** [0.126]		
CEO_TRADING_BASED_OC 1-period lagged			−0.543 [0.689]	−0.419** [0.347]
Controls	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
No. of obs.	882	13,896	118	1,471
Pseudo-R^2	0.132	0.103	0.308	0.161
Difference in CEO_HOLDER_67 (χ^2)	7.01			
Difference in CEO_HOLDER_67 (p-value)	0.0081			
Difference in CEO_TRADING_BASED_OC (χ^2)	7.2			
Difference in CEO_TRADING_BASED_OC (p-value)	0.007			

We explore the reasons for the result. One possibility is that an SCA, especially the first SCA, constitutes a significant shock, which causes the CEO to become more cautious and potentially less overconfident. Such a possibility is consistent with the finding in Bernile et al. (2017) that CEOs who experienced both extreme shocks (in their case, natural disasters) and the consequences of those shocks reduce their risk-taking behavior. This, in turn, coheres with prior findings in the psychology literature that disasters can influence individual risk-taking behavior in investments.[23] We assess the impact of a firm being sued in year t or year $t-1$ on a continuous analogue to CEO_HOLDER_67. We define this continuous analogue as the average "in the moneyness" of the CEO's options.

[22] We note that several other corporate characteristics can change in the years after the SCA. However, in unreported results, we find that the coefficients on the overconfidence measures are qualitatively similar if we control for differences in the controls rather than the level of the controls per se.

[23] For example, Cassar, Healy, and von Kessler (2017) and Cameron and Shah (2015) find that disaster survivors prefer less risky gambles. Similarly, Bucciol and Zarri (2013) indicate that disaster survivors prefer to invest in cash and less risky assets.

We construct this by using the continuous variable that Malmendier et al. (2011) discretize to obtain CEO_HOLDER_67.[24]

The results for these regressions are reported in Table 9. Panel A focuses on the impact of an SCA per se. Panel B analyzes the impact of the first SCA. In all cases, we include the controls from Table 3, industry effects, and year effects.[25] We also analyze subsamples in which the firm earned a nonnegative return in the years following the SCA. We do this to mitigate any concern that relation (or lack thereof) between SCAs and confidence is merely a mechanical consequence of a decline in stock price. The results in Panel A indicate that the occurrence of an SCA in year $t-1$ does not significantly reduce the CONFIDENCE measure

TABLE 9
Impact of SCAs on CEO Confidence Level

Table 9 presents models analyze the impact of a securities class action (SCA) on subsequent chief executive officer (CEO) CONFIDENCE. We define CONFIDENCE as the average value per vested option scaled by the average strike price of the options. The average value per vested option is the total (estimated) value of all options (ExecuComp: opt_unex_exer_est_val) scaled by the total number of such options (ExecuComp: opt_unex_exer_num). The average strike price works on the simplifying assumption that the options have call-like payoff structures, and thus, the strike price (X) is $X = S-(S-X)$, where S is the prevailing stock price and we compute the value of the options ($S-X$) as the aforementioned average value per vested option that we use as the numerator. All models control for the controls in Table 3. Panel A focuses on the impact of SCAs in general on subsequent confidence. Panel B focuses on only the impact of the first SCA and omits observations that postdate that SCA. The regressions are ordinary least squares (OLS) regressions. All models include Standard Industrial Classification (SIC) 2-digit industry effects and year effects, and use standard errors clustered by firm (reported in square brackets). *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: CEO Confidence (t)		
	Full	Return(t) ≥ 0	Return($t-1$) ≥ 0
Variable	Model 1	Model 2	Model 3
Panel A. Impact of SCAs on Confidence			
SCA_($t-1$)	−0.066	0.003	−0.008
	[0.068]	[0.130]	[0.142]
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
No. of obs.	14,915	7,219	7,547
R^2	0.205	0.285	0.235
Panel B. Focusing on First Lawsuit Only			
$t-1$: Has had 1 suit but not 2 suits	−0.145***	−0.177*	−0.203**
	[0.055]	[0.091]	[0.085]
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
No. of obs.	14,074	6,904	7,234
R^2	0.208	0.290	0.238

[24] We define CONFIDENCE as the average value per vested option scaled by the average strike price of the options. The average value per vested option is the total (estimated) value of all options (ExecuComp: opt_unex_exer_est_val) scaled by the total number of such options (ExecuComp: opt_unex_exer_num). The average strike price works on the simplifying assumption that the options have call-like payoff structures; thus, the strike price (X) is $X = S-(S-X)$, where S is the prevailing stock price and we compute the value of the options ($S-X$) as the aforementioned average value per vested option that we use as the numerator.

[25] The reported models are ordinary least squares (OLS) regressions. In robustness tests, we ensure the results are also robust to using quantile regressions, robust regressions, and Tobit models with a lower bound of 0, as appropriate.

at t, after controlling for other corporate characteristics. However, Panel B indicates that the first SCA does reduce the CEO's confidence level. These results are consistent with the idea that an SCA may constitute a shock that reduces CEO overconfidence, leading to a reduction in SCA likelihood.

E. Post-SCA Learning by Companies in Hiring Practices

In a similar manner to CEOs becoming more disciplined following an SCA, companies might alter their hiring practices if a CEO was associated with an SCA. Specifically, we expect that if a company was sued under its old CEO, it will select a new CEO who is less overconfident and, thus, would be associated with lower litigation risk. We test this hypothesis by analyzing the overconfidence level (represented by CEO_HOLDER_67) of the new CEO. In these tests, we identify all situations where the company's CEO in year t differs from that in year $t-1$. We then identify whether the prior CEO was associated with an SCA during his/her time at the company. Next, we obtain CEO_HOLDER_67 for the new CEO. We compute this measure in both year t and year $t+1$ to ensure that reporting errors around the turnover do not bias our results.

The results are reported in Table 10. The analysis is cross sectional. The main finding is that if a prior CEO was associated with an SCA, the company's newly hired CEO is less likely to be overconfident.[26] This applies when we use an indicator for whether the prior CEO faced an SCA (columns 1 and 3) or look at the total number of lawsuits leveled against the company during the prior CEO's time at the company. In unreported robustness tests, we also find that the results hold

TABLE 10
Confidence Level of Newly Hired CEO

Table 10 presents logit models that analyze whether the new chief executive officer (CEO) after a turnover event is overconfident. The sample is cross sectional and analyzes the overconfidence of the new CEO (measured in year t or year $t+1$) as a function of pre-turnover characteristics in year $t-1$ and in which the CEO in year t differs from the CEO in year $t-1$. We include only firm-year observations in which there is a turnover. The dependent variable in columns 1 and 2 is the CEO_HOLDER_67 measure of the new CEO computed in year t immediately after the turnover where the CEO in year t differs from the CEO in year $t-1$. The dependent variable in columns 3 and 4 is similar but computes the CEO_HOLDER_67 measure in year $t+1$. All models include Standard Industrial Classification (SIC) 2-digit industry effects and year effects, and use standard errors clustered by firm (reported in square brackets). * and ** indicate significance at the 10% and 5% levels, respectively.

	Dependent Variable			
	CEO_HOLDER_67_(t)		CEO_HOLDER_67_($t+1$)	
Variable	1	2	3	4
PRIOR_CEO_SUED	−0.386*		−0.378*	
	[0.203]		[0.201]	
#_SCA_AGAINST_PRIOR_CEO		−0.161**		−0.158*
		[0.080]		[0.082]
Controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
No. of obs.	1,427	1,427	1,370	1,370
Pseudo-R^2	0.155	0.155	0.138	0.139

[26] To put the results in perspective, approximately 67% of our sample of CEOs are classified as overconfident, according to the CEO_HOLDER_67 measure. However, only approximately 30% of CEOs hired after a class action are overconfident in our sample, suggesting a significant difference in confidence between old and newly hired CEOs.

if we require that the new CEO stays at the firm for at least 5 years (so the results are unlikely to merely reflect litigated firms having a "revolving door" of CEOs such that the new CEO, though overconfident, does not last long enough to for the CEO_HOLDER_67 measure to be meaningful). The results, overall, support Hypothesis 6 and are consistent with companies moderating their hiring practices to avoid overconfident CEOs.

V. Addressing Alternative Explanations and Robustness Tests

A. Media-Based Measures of Overconfidence

The main reported models use an option-based measure of overconfidence. However, the literature does show that there is a relation between compensation structures and litigation risk (see, e.g., Peng and Röell (2008)). This raises the possibility that option-based measures of overconfidence merely reflect the impact of CEOs' compensation structure. We argue that this is unlikely to be the case because i) the option-based measures of overconfidence are derived from the CEO's exercise (or lack thereof) of vested options, not merely from the receipt of options per se, and ii) we find that the impact of option-based compensation on litigation likelihood is separate and distinct from the impact of overconfidence.[27] Nonetheless, we check that the results are robust to alternative measures of overconfidence.

An alternative way of measuring overconfidence is through media-based measures as per Hirshleifer et al. (2012). We ensure the results are robust to a "net news" measure. We construct this measure by hand collecting news-based data between 2000 and 2006 from Factiva. To do this, we search for newspaper reports that refer to the CEO as "confident," "optimistic," and "positive" (for confident news) as opposed to reports that refer to the CEO as "not confident," "not optimistic," "not positive," or "cautious" (for nonconfident news). We then construct a net news measure as the number of confident reports less the number of nonconfident reports. We restrict attention to the set of firms that have at least one positive news item to: i) ensure that we are not biasing the sample by including thinly reported firms and/or firms for which we simply failed to obtain information and ii) form a concept of how the degree of overconfidence influences litigation risk.[28] We report the baseline models using the media-based measure in Table 11.[29] The results in the table are qualitatively similar to the reported results: Overconfident CEOs are more likely to be subject to an SCA than are other CEOs.

[27] In particular, when analyzing Statement of Financial Accounting Standards (SFAS) 123R, we find that a reduction in option-based compensation (following the accounting-rule change) reduces the impact of overconfidence on litigation likelihood, implying that it has a separate (albeit complementary) impact from overconfidence. These results are reported in the Supplementary Material.

[28] The results are stronger in our favor if we recode such missing values as 0 to "deem" such CEOs as having low confidence.

[29] In unreported tests, we find that the results are qualitatively similar if we twice-lag the media measure to further obviate any concern about feedback between the SCA and the single-lagged media measure.

TABLE 11
Robustness Test Using Media-Based Measures of Overconfidence

Table 11 presents regressions that examine the likelihood of a securities class action (SCA) using media-based measures of chief executive officer (CEO) overconfidence. The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). *** indicates significance at the 1% level.

Variable	Dependent Variable: SCA Indicator
NET_NEWS_($t-1$)	0.107***
	[0.038]
Controls	Yes
Industry fixed effects	Yes
Year fixed effects	Yes
No. of obs.	2,986
Pseudo-R^2	0.161

B. CEO Characteristics

A concern is that CEO_HOLDER_67 might be correlated with the option intensity of the CEO's compensation contract and/or its wealth-performance sensitivity, causing the results to reflect a spurious correlation between CEO_HOLDER_67 compensation. Ameliorating this concern, the foregoing results vis-à-vis the media-based measure of overconfidence and the Kolasinski and Li (2013) trading-based measure of overconfidence are not subject to this concern (as they are not derived from option holdings). Nonetheless, we check that the results are robust to controlling for the option intensity of the CEO's compensation contract and the wealth-performance sensitivity of that contract. We define the contract's option intensity to be the proportion of total pay that comes from option grants.[30] We obtain the scaled wealth-performance sensitivity measure from Edmans, Gabaix, and Landier (2009).[31]

The models controlling for option intensity are in Panel A of Table 12 and those controlling for wealth-performance sensitivity are in Panel B. CEO_HOLDER_67 remains positive and significant in all models, suggesting that compensation characteristics do not drive the results.

C. Repeat Lawsuit Targets

The results are robust to addressing the issue of firms being sued repeatedly. In the "raw" SCA data (i.e., set of SCAs for all firms before restricting the sample to the set of firms with relevant company-level variables), there are 2,559 lawsuits against 2,089 unique firms, of which 329 unique firms were sued more than once. In the data, 256 lawsuits (from 106 unique firms) overlapped in class periods. In percentage terms, 256/2,559 = 10% of lawsuits overlap in class periods; 106/329 = 32.2% of firms with multiple lawsuits overlap in class periods; 106/2,089 = 5.07% of unique firms were litigated in overlapping class periods. In our sample (with nonmissing control variables), removing firms that are

[30] In ExecuComp, we use tdc1 as the total compensation variable. The value of the option grants is option_awards_blk_value after Black and Scholes (1973) values were used and option_awards before then.

[31] The relevant wealth-performance sensitivity data are available from Alex Edmans's Web site (https://www.london.edu/faculty-and-research/faculty/profiles/e/edmans-a).

TABLE 12

Robustness Test after Controlling for CEOs' Compensation Contracts, Age, and Governance

Table 12 presents various models that test the relation between chief executive officer (CEO) overconfidence and the likelihood of a securities class action (SCA). The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: SCA Indicator
Panel A. Option Intensity	
CEO_HOLDER_67	0.257**
	[0.102]
CEO_OPTION_INTENSITY	0.305**
	[0.155]
Controls	Yes
Industry and year fixed effects	Yes
No. of obs.	18,811
R^2	0.143
Panel B. Wealth-Performance Sensitivity	
CEO_HOLDER_67	0.250**
	[0.120]
ln(WPS)	−0.026
	[0.045]
Controls	Yes
Industry and year fixed effects	Yes
No. of obs.	11,901
Pseudo-R^2	0.152
Panel C. CEO Age	
CEO_HOLDER_67	0.277***
	[0.101]
ln(CEO_AGE)	−0.005
	[0.007]
Controls	Yes
Industry and year fixed effects	Yes
No. of obs.	19,053
R^2	0.141
Panel D. Antitakeover Provisions	
CEO_HOLDER_67	0.215*
	[0.112]
G_INDEX	−0.037
	[0.024]
Controls	Yes
Industry and year fixed effects	Yes
No. of obs.	14,468
R^2	0.152

sued more than once results in a loss of only between 174 and 194 observations (depending on the controls required) from an overall sample of 1,375 litigation observations. The regression results are robust to omitting these observations. We report the regressions in Table 13. The main finding is that the results are qualitatively similar in these regressions: CEO overconfidence remains significantly and positively associated with the likelihood of an SCA.

D. Does the CEO–SCA Relation Merely Reflect Earnings Management?

We take steps to ensure that our results do not merely reflect the impact of CEO overconfidence on earnings management. Prior evidence suggests that overconfident CEOs' accounting statements are less conservative, including through

TABLE 13
Robustness Test after Removing Repeatedly Sued Firms from the Sample

Table 13 presents models that analyze the relation between chief executive officer (CEO) overconfidence and securities class actions (SCAs). The dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). *** indicates significance at the 1% level.

Variable	Dependent Variable: SCA Indicator
CEO_HOLDER_67_($t-1$)	0.286***
	[0.104]
Controls	Yes
Industry fixed effects	Yes
Year fixed effects	Yes
No. of obs.	18,954
Pseudo-R^2	0.133

postponing loss recognition as per Ahmed and Duellman (2013) and undertaking earnings smoothing as per Bouwman (2014). Thus, a concern is that the relation between overconfidence and SCAs merely reflects the previously documented impact of overconfidence on accounting practices. We mitigate this concern by ensuring that the results hold after controlling for absolute discretionary accruals.

We calculate discretionary accruals following the modified Jones (1991) model as per Ayers, Jiang, and Yeung (2006). We calculate the firm's TOTAL_ACCRUALS as its earnings before extraordinary items (EBEI) less its cash flows from operations (CASH_FLOWS, which we calculate as the firm's net cash flows from operating activities less its extraordinary items).[32] We scale TOTAL_ACCRUALS by the firm size in the prior year. For each year and 2-digit SIC industry, we estimate the regression:

$$\begin{aligned}\text{TOTAL_ACCRUALS}_{i,t} &= \alpha + \beta^{(1)}(\Delta\text{SALES}_{i,t} - \Delta\text{RECEIVABLES}_{i,t}) \\ &\quad + \beta^{(2)}\text{PPE}_{i,t} + \varepsilon_{i,t},\end{aligned}$$

where TOTAL_ACCRUALS is as defined previously, ΔSALES is the difference in the firm's SALES (Compustat: sale) between year t and year $t-1$, ΔRECEIVABLES is the change in accounts receivable (Compustat: reccch), and PPE is the firm's gross property, plant, and equipment. Because we estimate the regression separately for each 2-digit industry and year, we do not include industry and year effects, and we require that there be at least 10 firms in the industry–year pair as per Ayers et al. (2006). We scale all variables by the firm's total assets in year $t-1$. We define the firm's discretionary accruals as the difference between its TOTAL_ACCRUALS and that predicted by the preceding equation. Because earnings management can result in either positive or negative deviations from the "predicted" accruals, we take the absolute discretionary accruals. We denote this as ABS_DISC_ACCRUALS.

We report the results in Table 14. The core finding is that CEO_HOLDER_67 continues to increase litigation likelihood even after controlling for discretionary accruals. Furthermore, the interaction of CEO_HOLDER_67 with the earnings management measure is statistically insignificant. This suggests that the impact

[32] In specific Compustat codes, we define TOTAL_ACCRUALS as ibc – (oancf – xidoc).

of overconfidence does not depend significantly on, or merely reflect, a relation between CEO overconfidence and earnings practices.

TABLE 14
Robustness Test Using CEO Overconfidence, Earnings Management, and SCAs

Table 14 presents models that analyze the relation between chief executive officer (CEO) overconfidence, accruals, and securities class action (SCA) likelihood. The models are logit models in which the dependent variable is an indicator that equals 1 if the firm is subject to an SCA in year t. We report regression coefficients. Variable definitions are in the Appendix. All models are logit models that include industry and year fixed effects, and use standard errors clustered by firm (reported in square brackets). *** indicates significance at the 1% level.

Variable	Dependent Variable: SCA Indicator
CEO_HOLDER_67	0.467***
	[0.122]
ABS_DISC_ACCRUALS	2.279***
	[0.657]
CEO_HOLDER_67 × ABS_DISC_ACCRUALS	−0.950
	[0.799]
Controls	Yes
Industry fixed effects	Yes
Year fixed effects	Yes
No. of obs.	16,091
R^2	0.136

E. Systematic Differences and Panel Models

We also ensure that the results are robust to modeling technique. One concern is that there might be systematic differences between companies that are subject to an SCA and those that are not. We mitigate this by using propensity score matching techniques. These results are provided in additional panel regressions in the Supplementary Material. We perform 2 sets of propensity score matches. The first set matches overconfident CEOs to nonoverconfident CEOs. We match in 2 ways: First, we run a first-stage model predicting the likelihood that a CEO is overconfident. Next, we construct a distribution of propensity scores for the set of overconfident firms. Then, we identify the 10th percentile cutoff. Finally, we estimate the regression omitting any nonoverconfident CEO firm with propensity score that lies below this 10th percentile cutoff. In the second matching method, we undertake 1-to-4 nearest neighbor matching. Then, we match SCA firms to non-SCA firms in a similar way. In all cases, we find that overconfident managers' firms are more likely to face SCAs. We obtain similar results if we undertake 1-to-1 matching (instead of 1-to-4 matching) or if we use a different percentile cutoff instead of the 10th percentile (e.g., the results are robust to using the 5th and 15th percentiles). We also find similar results in a regression that uses firm and year fixed effects.

F. Option-Based Overconfidence and Firm Performance

One concern is that option-based measures of overconfidence increase with the firm's performance; thus, CEO_HOLDER_67 might merely proxy for other extraneous market movements. The media-based measure of overconfidence at least partially mitigates this concern. Nonetheless, we also address this concern by using a "residual" measure of CEO overconfidence. We define the RESIDUAL_CEO_HOLDER_67_($t-1$) variable as the residual from the

regression $\text{CEO_HOLDER_67_}(t-1) = \alpha + \beta \times \text{RETURN_}(t-1) + \varepsilon$, where RETURN is the firm's stock return. This $\text{RESIDUAL_CEO_HOLDER_67_}(t-1)$ captures the portion of CEO overconfidence that does not merely reflect stock returns. These results are available in the Supplementary Material. The results are qualitatively similar to those previously reported.

G. Reverse Causality: Overconfident CEOs Self-Selecting into High-SCA-Risk Companies

An alternative explanation for our baseline result, that is, overconfidence is associated with increased litigation risk, is that overconfident individuals optimistically believe they can manage a risky company and are relatively more willing to take such risks. In this case, the company's high litigation risk could cause it to select an overconfident CEO, rather than the overconfident CEO increasing litigation risk. Our previous results suggest that such reverse causality concerns do not explain the results. The finding in Table 10 that companies prefer to avoid hiring such litigation-risk-prone CEOs following an SCA suggests that reverse causality of that type is unlikely to drive our baseline results.

H. Endogeneity Concern: CEOs Make False Statements to Boost Value of Options

A possible concern is that CEO_HOLDER_67 is premised on the CEO holding options that are at least 67% in the money. However, if the CEO pumps up the stock price, this would also increase the value of her option holdings and could lead to those options becoming at least 67% in the money. Furthermore, prior evidence suggests that CEOs might strategically time their trading and, by parity of reasoning, option exercises (Billings and Cedergren (2015)). Thus, the conduct leading to the SCA might create the appearance of the CEO intentionally holding high in-the-money options, when in fact it was an indirect consequence of misstatement.

We argue that endogeneity is unlikely to drive the results, based on 5 arguments. First, the options must be at least 67% in the money in at least 2 separate years, minimizing the chance of the CEO making false statements that merely indirectly inflate the value of the options. Second, the results are qualitatively similar if we use alternative measures of overconfidence that are not subject to this criticism (see Table 11). Third, the literature shows that such risk-taking tendencies (connoted by measures such as CEO_HOLDER_67) tend to derive from genetic characteristics. For example, Cesarini, Johannesson, Lichtenstein, and Wallace (2009) examine sets of twins and argue that genetics explains between 16% and 34% of an individual's overconfidence. Cronqvist and Siegel (2014) suggest that genetic differences can explain up to 45% of the variation in investment biases in individual investors. Similarly, Cronqvist, Münkel, and Siegel (2014) argue that genetic characteristics explain home ownership choice (which suggests that could also explain risk taking in investment, in general) and/or early life experiences (see, e.g., Bernile et al. (2017), Malmendier et al. (2011)). Similarly, Malmendier et al. (2011) show that early-life experiences, such as growing up in the Great Depression or having military experience, are associated with the degree of managerial overconfidence and influence

corporate risk-taking tendencies. Fourth, "informed" traders often short the company's stock (or manufacture a short position) before SCAs as in Blau and Tew (2014), which implies that CEOs should exercise any options before the SCA. In other words, the prospect of an SCA would not cause the CEO to hold in-the-money options. Finally, such stock price manipulation would be short term at best. If CEOs were to make false statements simply to increase the value of their options, they would benefit only if they exercised the options before the market became aware of the true facts (whereupon the stock price would decline) and would risk violating insider-trading rules, which carry criminal penalties.

Nonetheless, in unreported tests, we take additional steps to mitigate these endogeneity concerns. First, the results are qualitatively similar if we exclude any situation where the firm is subject to 2 SCAs. This excludes any situation where the CEO could have pumped up the stock price twice (rendering the CEO overconfident according to the CEO_HOLDER_67 definition). Thus, it excludes certain situations where the CEO's conduct giving rise to the SCA also inflated the stock price and created the appearance of overconfidence.

Second, we obtain qualitatively similar results if we measure overconfidence based on the CEO's conduct after year t. In this case, it is necessary for the options to be at least 67% in the money on 2 occasions after the SCA, meaning that the falsely positive misstatement cannot have driven the value of the options.

Third, in unreported tests, we obtain qualitatively similar results if we omit any situation where the CEO would have "inflated" the stock price in order to exercise her options. The underlying concern is that the CEO might "hype" the stock, which would give rise to the SCA and make options look more valuable, causing the CEO to appear to be overconfident. We address this concern by excluding any situation where the CEO exercises options in year t or year $t-1$, when the SCA was in year t. The results for these tests are qualitatively similar to the reported results.

I. Does the SCA–Overconfidence Relation Merely Reflect Volatility?

One concern is that the relation between SCAs and overconfidence merely reflects volatility (i.e., overconfident CEOs take more risk). Riskier firms are more likely to face SCAs. Thus, the relation between overconfidence and SCAs might merely reflect volatility. The baseline models include volatility as a control variable. Nevertheless, to further explore this issue, we perform regressions that interact CEO overconfidence with volatility: A statistically insignificant interaction term indicates that the SCA–overconfidence relation does not depend on volatility. We find that CEO overconfidence remains significantly and positively associated with litigation risk. The interaction term is statistically insignificant. The results are qualitatively unchanged regardless of whether we make relevant corrections for standard errors on interaction effects in logit models as per Ai and Norton (2003). These results are available in the Supplementary Material.

J. Does an Overconfident CEO Merely Represent Aggressive "Corporate" Culture?

A concern is that aggressive corporations, which are more likely to be subject to SCAs because of their risk-taking culture, seek overconfident CEOs, meaning

that the overconfidence–SCA relation merely reflects other corporate factors. We argue that this is unlikely to be a concern. First, we control for corporate characteristics, including corporate risk (as proxied by stock return volatility). Second, Table 4 partially ameliorates this concern: The overconfidence level of junior executives captures the nature of the firm's corporate culture if an aggressive firm also tends to hire more overconfident junior executives. However, the overconfidence of junior executives is not significantly related to SCA likelihood after controlling for the overconfidence of senior executives (i.e., decision makers). Thus, it is unlikely that CEO overconfidence merely captures another corporate trait. Third, as indicated previously, the results are robust to including firm fixed effects, which control for unobserved time-invariant firm attributes, which includes a particularly aggressive and persistent corporate culture.

K. CEO Inattention and the Option-Based Measure of Overconfidence

A possible concern with option-based measures of overconfidence relates to CEO inattention. Specifically, if a CEO holds relatively few options, she might hold well-in-the-money options because the value of exercising them is low and the CEO might simply ignore them. We argue that this is unlikely to drive the results given that they are robust to using a media-based measure of overconfidence (see Table 11). Nonetheless, in unreported analysis, we find that our main results hold if we exclude CEOs whose option holdings (i.e., value of vested but unexercised options) are in the bottom quartile of the sample for that year.

L. Does CEO Overconfidence Capture Poor Corporate Performance?

An issue with the models is whether CEO overconfidence merely reflects poor corporate performance. The baseline models address this in part by controlling for the prior year's stock return. Furthermore, we analyze the interaction of CEO_HOLDER_67 and prior returns: either the return over year $t-1$ or an indicator for whether the return was negative. These results are available in the Supplementary Material. The main result is that although the interaction term is statistically insignificant, CEO_HOLDER_67 remains statistically significant. This further indicates that the relation between SCAs and CEO overconfidence does not merely reflect prior poor performance.

M. Nondetection of "Misconduct"

A factor that could affect results is the nondetection of managerial misconduct. Specifically, it is possible that a CEO may have engaged in actions that satisfy the criteria for an SCA but that shareholders i) chose not to sue and/or ii) did not detect such actions. In our sample, both are unlikely: Our sample contains only S&P 1500 firms, which are large companies with analyst coverage and media scrutiny (rendering detection likely). Furthermore, such S&P 1500 companies ordinarily have sufficient financial resources to make a successful litigation financially beneficial to a plaintiff. Additionally, in the United States, unlike in some other countries, forming a "class" to undertake a class action is comparatively straightforward, and litigation funders ensure that the indigence (or otherwise) of the plaintiffs does not lead to underlitigation in cases where there is a legitimate cause of action (as opposed to a frivolous case).

To illustrate this, approximately 4%–5% of our firm-year observations involve an SCA. By contrast, Chapple, Clout, and Tan (2014) find that there are 30 SCAs in Australia (on the Australian Securities Exchange (ASX)) against any Australian listed company between 1999 and 2010. Australia has laws covering continuous disclosure (and the theoretical ability to litigate) similar to the United States, containing an equivalent to Rule 10b-5. However, Australia has greater restrictions on forming a class and using a litigation funder. The number of firms listed on the ASX in any given year varies. However, it exceeds 1,500 in each year of the sample (suggesting 18,000 potential firm-year observations over this period), in which case fewer than 0.1% of the firm-year observations experience an SCA. Even if the focus is on the largest 500 companies listed on the ASX 500 (to ensure availability of all relevant controls), only $30/6{,}000 = 0.5\%$ of the sample exhibit an SCA. Thus, whereas underlitigation of misconduct might be a concern in Australia, it is less of a concern in the United States (for the previously mentioned reasons).

N. CEO Age

CEO age is arguably associated with corporate risk taking, with younger CEOs associated with riskier corporate policies (see, e.g., Serfling (2014), Kim (2013)). In unreported tests, we analyze whether the results are robust to controlling for CEO age, or indicators for whether the CEO is over 50, 60, or 65 years old. CEO age is generally negatively related to litigation likelihood.[33] Controlling for these measures of CEO age does not qualitatively change the relation between CEO overconfidence and litigation likelihood (see, e.g., Panel C of Table 12). We also conduct additional tests to analyze whether the impact of overconfidence varies across CEO age. These results are available in the Supplementary Material. We find that the interaction of CEO age with CEO_HOLDER_67 is not statistically significant. Additionally, if we split the sample into "young CEOs" (age in the bottom half of the sample) and "old CEOs" (age in the top half of the sample), we find that CEO overconfidence is positively and significantly related to litigation risk in both subsamples.

O. Managerial Entrenchment

Managerial entrenchment may influence litigation likelihood. On the one hand, entrenched managers are subject to less outside disciplinary action, and thus, they are more free to engage in actions leading to an SCA. On the other hand, entrenched managers may seek to "enjoy the quiet life," whereby they engage in relatively less risk taking as in Bertrand and Mullainathan (2003), which, though potentially undermining shareholder wealth, lowers the risk of an SCA. Whichever is the case, we check that the results are robust to controlling for the Gompers, Ishii, and Metrick (2003) index of 24 antitakeover provisions (see, e.g., Panel D of Table 12). In unreported results, we find that the coefficient on CEO_HOLDER_67 is robust to controlling for the Bebchuk, Cohen, and Ferrell (2009) index of 6 antitakeover provisions, or indicators, for whether the company's index value is above the sample median or is in the top quartile.

[33] However, the statistical significance of the coefficient is sensitive to the control variables used.

P. CEO Gender and Board Gender Diversity

We check that the results do not merely reflect a CEO-gender effect. Levi, Li, and Zhang (2014) argue that female CEOs are less overconfident than are male CEOs, leading to fewer takeover bids and more value creation in those bids. However, Adams and Ragunathan (2017) argue that female directors are not per se associated with lower risk taking. Nonetheless, we check that our results are robust to controlling for CEO gender and we interact an indicator for whether the CEO is female with the overconfidence measure. The results are unreported for brevity. Only 1.7% of the observations in our sample feature a female CEO. The impact of CEO overconfidence on litigation risk varies slightly across CEO gender: Overconfident female CEOs are less likely to face SCAs than are overconfident male CEOs. This may be consistent with Levi et al. (2014). However, the result is only weakly significant and there are relatively few female CEOs in the sample, making it difficult to draw strong conclusions from the results. Similarly, we find that board gender diversity is not statistically significantly related to litigation likelihood.

Q. Impact of Industry/Year Conditions, and Linear Probability Models

The reported results include year and 2-digit SIC industry fixed effects, and cluster standard errors by firm as per Kim and Skinner (2012). The results are robust to clustering by year, industry, or both. Clustering by year produces smaller standard errors than does clustering by firm. The results are also robust to how we define industry and remain significant when we use 3- or 4-digit SIC codes or the Hoberg–Phillips (2016) industry classification. Finally, the results are qualitatively similar if we control for industry–year interaction effects (i.e., where we include an indicator for each industry–year pair), suggesting that the results do not merely reflect a correlation between overconfidence and industry conditions.[34] We report these results in the Supplementary Material.

An additional concern is that nonlinear models can produce biased coefficients in the presence of large numbers of fixed effects as per Greene (2004). We address this concern by rerunning the analysis using linear probability models. The results for our baseline models are provided in the Supplementary Material and, consistent with reported logit results, indicate that overconfident CEOs are associated with greater likelihood of SCAs.

VI. Conclusion

In this article, we analyze the impact of CEO overconfidence on the likelihood of an SCA. By definition, overconfident CEOs tend to overestimate the potential payoffs of projects and underestimate their risks. This could result in overconfident CEOs' statements being reckless and falsely positive, thereby exposing the company to a 10b-5 SCA. We hypothesize and show that overconfident CEOs' firms are more likely to be sued via an SCA.

[34]Note that when doing this, we must interact 1-digit SIC industry with year because the large number of industry–year pairs at finer industry definitions prevent the logit model from converging. If, instead, we use a linear provability model, we can also use 2-digit × year interactions. Such results are qualitatively similar to the reported results.

Furthermore, improved governance mitigates the impact of overconfidence on SCA likelihood. Specifically, the impact of overconfidence on SCA likelihood decreases following SOX and the changes to the NYSE/NASDAQ listing rules.

We find that SCAs appear to serve a learning function for overconfident CEOs, with an SCA reducing the impact of CEO overconfidence on future litigation risk. This suggests that SCAs persuade overconfident CEOs to attenuate their tendency to make overconfident and falsely positive statements, or to be cavalier about omitting material information (overconfident in their belief that the firm could rectify a negative outcome). This finding is consistent with the finding in Kolasinski and Li (2013), in the context of takeovers, that overconfident CEOs learn from past actions. These results contribute to the policy debate about the welfare effects of SCAs, which some have criticized as being largely frivolous and wasteful.

This article contributes to the literature on both CEO overconfidence and securities regulation. We demonstrate another avenue through which CEO overconfidence can undermine shareholder wealth (exposing the company to an SCA). This highlights the need for shareholders to be cautious when interpreting statements provided by overconfident CEOs. This article also contributes to the regulation literature by exploring an additional antecedent to financial misstatements (CEOs' behavioral biases).

Appendix. Variables

CONFIDENCE: Average value per vested option scaled by average strike price of the options.

CEO_HOLDER_67: Indicator variable that equals 1 from the first time the CEO holds options that are (on average) at least 67% in the money if the CEO does so on at least 2 occasions, computed as in Malmendier et al. (2011). We use ExecuComp data to obtain a measure for how in the money the options are, on average. We first create a measure of the extent to which the options are in the money, defined as average value per option/number of options, where the average value per option is the estimated value of the vested option scaled by the number of such options. We then scale this in-the-moneyness variable by the average strike price for the options, which we proxy as $S-(S-X)$ = stock price at the end of the fiscal year (in CRSP/Compustat: prcc_f) − average value per option (computed as indicated previously).

ln(CEO_AGE): Natural log of the CEO's age.

TEAM_HOLDER_67: Average CEO_HOLDER_67 measure for all executives at the firm that year. We compute CEO_HOLDER_67 for non-CEO executives the same way as we compute CEO_HOLDER_67.

SENIOR_EXECUTIVE_HOLDER_67: Average CEO_HOLDER_67 measure for all senior executives at the firm that year. We compute CEO_HOLDER_67 for non-CEO executives the same way as we compute CEO_HOLDER_67. We define senior executives as any executive with the title (in ExecuComp) of chief executive officer (CEO), chief financial officer (CFO), chief operating officer (COO), president, chairman/woman, and executives whose title includes the word "chief."

JUNIOR_EXECUTIVE_HOLDER_67: Average CEO_HOLDER_67 measure for all junior executives at the firm that year. We compute CEO_HOLDER_67 for non-CEO

executives the same way as we compute CEO_HOLDER_67. We define junior executives as any nonsenior executive.

NET_NEWS: Number of articles referring to the CEO as overconfident minus the number of articles referring to the CEO as nonconfident.

CEO_TRADING_BASED_OC: Loss of wealth of CEO from acquired shares in the previous period.

NYSE: Indicator variable that equals 1 if the firm trades on the New York Stock Exchange, and 0 otherwise.

ln(ASSETS): Natural log of the firm's book assets (Compustat: at).

ROA: Firm's return on assets, defined as net income scaled by assets.

SALES_GROWTH: Sales growth in year $t-1$ is sales in year $t-1$ less sales in year $t-2$ scaled by assets at the beginning of year $t-1$.

RD: Research and development (R&D) expense (Compustat: xrd) scaled by beginning-of-year assets.

PPE: Firm's property, plant, and equipment scaled by assets.

MB: Firm's market value of equity at the end of the fiscal year (Compustat: prcc_f $\times$ csho) scaled by book value of equity.

RETURN: Firm's market-adjusted stock return over the year (with stock return data from CRSP).

SKEW: Skewness of the firm's stock return over the year.

RETURN_STD_DEV: Standard deviation of the daily stock return over the year.

TURNOVER: Trading volume for the year scaled by the number of shares outstanding at the beginning of the year.

INST_OWN: Percentage of shares that institutional investors hold. The institutional-holding data are from Thomson 13F filings. If the firm does not appear in the filings, it is deemed to have 0 institutional holdings.

EQUITY_PROCEEDS: Amount of capital the firm raises via equity issuance in the year scaled by the firm's assets.

DEBT_PROCEEDS: Amount of capital the firm raises via debt in the year scaled by the firm's assets.

INSIDER_TRADING: Insider trading figure for year $t-1$ is average insider sales (net of purchases) for years $t-1$ and $t-2$ scaled by the firm's revenue.

INSIDER_HOLDING: Average of all insider share holdings scaled by total shares outstanding.

IND_WC: Industry average working capital accruals (current assets less current liabilities) scaled by total assets.

IND_ALTMAN_Z: Industry average Altman (1968) z-score.

SUED: Indicator variable that equals 1 if the firm was subject to an SCA, and 0 otherwise. The data are from the Stanford Securities Class Action Clearinghouse.

INTERNAL_CEO: Indicator variable that equals 1 if the CEO is hired from internal executive, and 0 otherwise.

FEMALE_CEO: Indicator variable that equals 1 if the CEO hired is female, and 0 otherwise.

CEO_TURNOVER: Indicator variable that equals 1 if a new CEO is appointed in period t, and 0 otherwise.

POST_SOX: Indicator variable that equals 1 if the observation is after SOX (i.e., 2002 or later), and 0 otherwise.

G_INDEX: Firm's Gompers et al. (2003) index of 24 antitakeover provisions.

ABS_DISC_ACCRUALS: Absolute value of the discretionary accrual.

CEO_PCT_SHARES_OWNED: CEO's percentage share ownership.

CEO_STOCK_INTENSITY: CEO's stock intensity, defined as the proportion of compensation that comes from stock grants scaled by total compensation. The data come from ExecuComp.

WPS: Natural log of the coefficient estimate from the regression of CEO's incentive pay on firm performance.

CEO_OPTION_INTENSITY: CEO's option intensity, defined as the proportion of compensation that comes from option grants scaled by total compensation. The data come from ExecuComp.

Supplementary Material

Supplementary Material for this article is available at https://doi.org/10.1017/S0022109018001291.

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