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Keywords

executive overconfidence, fraud, earnings management, corporate governance

Disciplines

Accounting

Executive Overconfidence and the Slippery Slope to Financial Misreporting

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Abstract

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Keywords: executive overconfidence; fraud; earnings management; corporate governance

Data Availability: data are available from sources identified in the paper.

JEL Classifications: G34; M14; M41

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1. Introduction

The goal of this analysis is to improve our understanding of why firms misstate earnings. We provide a detailed analysis of 49 firms subject to SEC Accounting and Auditing Enforcement Releases (AAERs) in the 1990s and 2000s. In only 25% of the misstatements (13 of the 49), the AAERs suggest a degree of managerial intent that is consistent with a legal claim of fraud defined within the context of SEC Rule 10b-5. We refer to these AAER cases as “*frauds*.” The majority of the AAERs (remaining 75%), however, do not suggest the same degree of fraudulent intent and thus we refer to them as “*misreporting*.”¹

For the misreporting cases, our collective evidence suggests the following explanation. These cases begin with an optimistically biased, but not necessarily intentional, misstatement. The optimistic bias could reflect an unintentional accounting judgment that *ex post* is identified as optimistic. Alternatively, it could reflect an intentional, but relatively minor, overstatement of earnings made by a manager who is optimistic that future performance will be sufficient to cover the reversal or that the earnings misstatement will go undetected. In either case, when optimistic performance expectations are not realized, the executive makes the decision to intentionally misreport (i.e., manage earnings).² The amount of the misstatement is for an increasing amount to cover the reversal of the previous period’s optimistic misstatement and maintain the trend set by previous (misstated) earnings. While the initial misstatement may or may not have been intentional, the subsequent misreporting that becomes the subject of SEC enforcement is intentional and of larger magnitude. Thus, an optimistically biased initial misstatement, even if

¹ We define an optimistic bias to be unrealistic (positive) beliefs about *any* aspect of the distribution of an uncertain outcome, such that the mean is overstated. This definition includes unrealistic (positive) beliefs about the levels of outcomes (e.g., cash flows) and unrealistic (positive) beliefs about some aspect of the distribution such as underweighting the likelihood of negative outcomes or underestimating the range.

² We use the term “earnings management” to describe intentional misstatements consistent with the definitions in Schipper (1989) and Healy and Wahlen (1999).

unintentional, starts the executive on a “slippery slope” that leads to a greater probability of misstatement and an SEC enforcement action.

Further analysis of the executives involved in the 36 misreporting cases suggests that the optimistic bias in the initial misstatement is associated with managerial overconfidence. We support the finding of a link between overconfidence and AAER propensity with evidence from two larger samples – high-tech firms and a broad sample that spans multiple industries.

We provide a series of results based on our focused analysis of the detailed sample that support the slippery slope scenario described above. We begin by showing that a sample of firms matched on size and industry has similar changes in unmanaged earnings subsequent to the period of the initial misstatement. This evidence is not consistent with a scenario in which all firms reflect similar optimism in their financial statement accruals, but the misreporting firms realized a bad draw on unmanaged income subsequent to the initial misstatement. The pattern instead suggests that the misreporting firms were more optimistic than the matched sample.

We next investigate two potential sources of the optimistic bias. We first compare monitoring at the misreporting and matched sample firms. The purpose of the analysis is to determine whether the executives at the misreporting and matched sample firms are similarly optimistic, but that better monitoring at the matched sample firms prevents a manager’s optimistic bias from affecting the financial statements. We then compare the executives at the misreporting and matched sample firms to ascertain if those at the misreporting firms are more optimistically biased. These two sources are not mutually exclusive explanations for optimistic bias at the misreporting firms. It may be the case that the executives at the misreporting firms are more optimistically biased than those at the matched sample firms and, in addition, weaker monitoring allows their inherent bias to be reflected in financial reporting.

Our first analysis, which compares monitoring mechanisms, shows no significant differences between the misreporting and the matched sample firms with respect to commonly studied proxies. Specifically, we find no differences in block ownership, board size, board composition, and measures of board member entrenchment, with the exception of weak evidence on the role of outside directors. Thus, the results do not suggest that better monitoring of the matched sample executives explains the greater optimistic bias in the financial reports of the misreporting firms. The lack of evidence warrants both a caveat that we have a small sample and an acknowledgment of the difficulties in defining and measuring good governance (Larcker, Richardson, and Tuna 2007; Armstrong, Guay, and Weber 2010; Brickley and Zimmerman 2010).

Our second analysis suggests that the executives involved in the misreporting are more overconfident than the matched sample executives. Since overconfidence is associated with optimistic bias (e.g., [Weinstein and Klein, 1996](#)),³ overconfident executives are more likely to make an initial misstatement and are thus more likely to start on the slippery slope.

Overall, our evidence in support of executive overconfidence as a source of the optimistic bias of the 36 misreporting firms is mixed. Our primary finding in support of different overconfidence levels between the two samples is that the executives at the misreporting firms receive *less* variable compensation than the matched sample of executives. de la [Rosa \(2008\)](#) and Gervais et al. (2010) both predict that overconfidence is associated with less variable compensation. Thus, our finding is consistent with the misreporting executives having greater overconfidence, and hence more optimistic bias, relative to the matched sample of executives. This finding is particularly informative because the misstatements occur despite the weaker

³ Overconfidence also has been associated with optimistic bias in executive decisions including investments and financing (e.g., [Malmendier and Tate, 2005](#); [Ben-David, Graham, and Harvey, 2007](#); [Malmendier, Tate, and Yan, 2007](#); [Hirshleifer, Low, and Teoh, 2010](#)).

incentives to commit fraud as a result of less performance-based pay. Another finding that is consistent with greater optimism at the misreporting firms is that the misreporting firms are hiring new employees at the time of the initial misstatement even though they have declining performance. This finding suggests that the manager is optimistic about future performance, not just about his ability to avoid discovery.

However, evidence from objective indicators of managerial overconfidence such as the executive's education level and gender are generally not significantly different between the misreporting and matched executives. A possible explanation for the mixed evidence is that the compensation proxies better capture cross-sectional variation in executive type. Compensation is an endogenous outcome of the contract negotiation process while indicators such as education, CPA status, and gender are likely to be noisy measures of overconfidence. Given the mixed evidence, we also explore the relation between overconfidence and AAERs later in two additional larger samples where we can use correlates with overconfidence.

In summary, the various analyses of the detailed sample suggest that misreporting is associated with an initial misstatement that is optimistically biased, and that the optimistic bias is associated with executive overconfidence. An analysis of patterns in unmanaged earnings suggests that the financial reports of the misreporting firms are indeed more optimistically biased; it is not the case that they are equally optimistic about earnings in expectation but the misreporting firms simply get a bad draw on earnings. The analysis of monitoring mechanisms (subject to the previously discussed caveats) does *not* suggest that weaker monitoring at the misreporting firms is the source of the relative optimistic bias in their issued financial statements. Finally, an analysis of executive characteristics, which includes evidence on compensation

contracting and hiring decisions at the misreporting firms, provides mixed evidence that overconfidence is a source of the optimistic bias.

The final element of the analysis of the detailed sample is an examination of the 13 fraud cases. The fraud cases more frequently involve reporting fictitious (rather than premature) revenue, hiding debt off the balance sheet, and manipulating multiple accounts. The fraud firms exhibit poor performance in the first year of the fraud, but they continue the fraudulent reporting, and even increase it, despite subsequent improvements in performance. The fraud firm executives have significantly more fixed and variable compensation than the misreporting executives, consistent with the fraud firm executives exhibiting narcissism, which is a behavioral trait related to overconfidence as discussed in Section 3.1. Finally, consistent with the SEC's characterization of the actions by these firms as being primarily motivated by personal gain, the executives at these firms are more likely to serve jail time and have more severe sentences given that they serve. Taken together, these findings suggest that the initial misstatement in the fraud cases reflects a greater intent to deceive for personal gain relative to the misreporting cases.

In summary, the detailed sample analysis suggests that an optimistic bias helps explain why executives at the misreporting firms start down the slippery slope. Our results supporting overconfidence as the source of the optimistic bias, however, are mixed. Two possible explanations for the mixed results in the univariate tests include the small sample size and noisy external indicators of overconfidence such as education, age, gender, and CPA status.

We use two alternative samples to further examine the relation between overconfidence and AAER propensity. The first alternative sample is firms in the software and hardware industries between 1992 and 2004. These industries have a relatively large proportion of firms with AAERs and useful variation in managerial characteristics ([Chatterjee and Hambrick, 2007](#)).

Of the 92 firms in this industry that meet our data requirements, eight are subject to an AAER during the period. We create overconfidence scores for executives at these firms and find strong evidence that higher overconfidence scores are associated with a greater probability of an AAER. We also include proxies for monitoring characteristics and find that overconfidence remains an incremental determinant of AAER propensity. The finding on monitoring, however, is subject to the previously noted caveat that the notion of good governance is difficult to identify and measure.

The second alternative sample is a broad sample of firms that spans all industries from 1989 to 2001. We identify AAER firms within this sample using the data provided by Dechow, Ge, Larson, and Sloan (2011). We create two firm-level measures of overconfidence for the executive pool. The first proxy is based on option compensation exercise behavior (Malmendier and Tate, 2005 and 2008; Li, Minnis, Nagar, and Rajan, 2009). The second proxy infers overconfidence from the executives' other investment and financing decisions. We find that firms with a more overconfident pool of executives have a greater AAER propensity.

The analysis raises the question of how overconfidence can be a prevalent characteristic of executives if greater overconfidence leads to distorted decisions including financial reporting decisions as we document. Recent studies provide an explanation by offering examples of positive externalities of executive overconfidence that offset the noted negative consequences (e.g., Goel and Thakor, 2000; [Gervais and Goldstein, 2007](#); Gervais et al., 2010).⁴ An interesting question then is how to recognize and moderate the consequences of overconfidence

⁴ The idea that overconfidence might be a desirable trait in a manager is consistent with recent studies that predict that humans optimally choose overconfidence despite its negative effects on certain tasks because of spillover effects to other decisions or to other time periods (e.g., [Bénabou and Tirole, 2002](#); [Compte and Postlewaite, 2004](#); [Brunnermeier and Parker, 2005](#)).

on financial reporting, especially in light of our results that objective indicators of overconfidence such as education and CPA status are not reliable.

This paper is organized as follows. Section 2 presents the detailed analysis of 49 misreporting and fraud firms with extensive hand-collected data and section 3 includes the analysis of the optimistic bias of the executives at these firms. Section 4 describes the tests using the high-tech sample and the broad sample and section 5 concludes.

2. Detailed review of 49 firms subject to AAERs

The primary AAER sample that we analyze includes 49 of the 50 firms examined in Erickson, Hanlon, and Maydew (2006, EHM) that were subject to AAERs from January 1996 to November 2003.⁵ The EHM sample includes corporations subject to at least one AAER for which compensation data are available. EHM do not eliminate firms in particular industries or otherwise impose selection bias.

We independently read all AAERs associated with each case.⁶ In 13 of the 49 cases, the AAERs indicate that the primary motivation for the misstatement was personal gain via insider trading or increased compensation and the SEC required at least one executive to disgorge ill-gotten gains, including insider trading profits, bonuses, or other compensation. In contrast, the remaining 36 cases cite primary motives of meeting either internal targets such as budgets or external targets such as Wall Street forecasts or investor expectations (26 cases) or of increasing stock price in the short term because of an anticipated external financing transaction (six cases).

⁵ We eliminate Thor Industries because the AAER accuses a subsidiary-level controller of managing earnings to hide his theft of cash from corporate-level executives. The SEC does not accuse the firm of securities law (10b-5) violations.

⁶ We use the term “case” to designate a single allegation of financial misreporting by the SEC, which may be described in multiple AAERs as additional information comes to light or resolution is obtained. As seen in Bonner, Palmrose, and Young (1998), AAERs cover both cases based on intent as well as those related to disagreements and negligence. We examine AAERs rather than restatements as Hennes, Leone, and Miller (2008) suggest that 76% of restatements in 2002-2005 are the result of errors.

Other motivations in these 36 cases include influencing merger transactions, moving exchanges, or hiding details that would reveal bad business decisions (e.g., credit losses/store closings). The individuals involved in these 36 cases would benefit from the misstatement along with other shareholders, but personal gain at the expense of the shareholders is not alleged by the SEC as the primary motive. Moreover, the individuals involved in the remaining 36 cases were not required to disgorge ill-gotten gains, even if they financially benefited, albeit indirectly, from the misstatement. Financial penalties, if any, included a potential loss in future income because of restrictions on their activities.

The fact that a primary motive of personal gain distinguishes the cases is consistent with pleading standards for fraud in SEC Rule 10b-5 actions. To prove fraud, plaintiffs must establish a “strong inference” of intent to deceive or harm. The SEC’s allegation that personal gain was a primary motivator is consistent with the type of evidence that would support a strong inference of intent.⁷ The SEC’s greater financial penalties for the executives in the 13 cases also suggest that the SEC believes these cases to be distinct and more consistent with a fraud claim that could be sustained in court. Consistent with the greater SEC penalties, the executives at the 13 fraud cases face greater criminal penalties relative to executives in the other 36 cases. Over 45% of the cases that we classify as frauds result in at least one executive serving jail time, compared to only 14% in the remaining cases. Further, the executives serving jail time at the fraud cases are required to serve approximately twice as long, with the mean (median) sentence of 77 (45) months relative to 48 (21) months.

⁷ The United States Supreme Court’s decision in *Tellabs, Inc. v. Makor Issues & Rights, Ltd.*, established pleading standards for the strong inference of intent required in a 10b-5 action after the Private Securities Litigation Reform Act (1995). A part of their decision that is relevant to our study is that the evidence must be “cogent and compelling” when weighed against other explanations. Thus, if personal gain is the primary motive for the fraud, it is more likely to meet the evidentiary standard than a misstatement with another motive such as meeting an analyst target. In addition, evidence of insider trading also is frequently used by plaintiffs to establish intent ([Johnson, Nelson, and Pritchard, 2007](#)).

We refer to the 13 cases that are motivated by personal gain and require a disgorgement of funds as “frauds” because they are consistent with the pleading standards in 10b-5 actions. The misstatements in the remaining 36 cases are classified as cases of “misreporting.” To be clear, we are not implying that the misreporting cases are unintentional. The alleged misstatements in the AAERs are intentional acts, not errors. However, the level of intent and the nature of the allegations are unlikely sufficient to meet the pleading standards for *scienter*.

2.1. Analysis of nature and timing of alleged misstatement activities

Table 1 provides a summary of the misstatement activities. In both the fraud and misreporting cases, increasing earnings is the primary goal and improper revenue recognition is the most frequently alleged activity, consistent with evidence in Dechow, Sloan, and [Sweeney \(1996\)](#), Farber (2005), and COSO (1999). The misreporting cases allege more issues involving premature revenue recognition while the frauds more frequently allege reporting of fictitious revenue and have as a goal hiding debt off the balance sheet. The frauds also more often involve multiple accounts. While we view these patterns as merely descriptive due to small samples and univariate tests, the patterns nonetheless provide a preliminary indication that the misreporting firms are distinct from the fraud firms.

We next examine patterns in earnings and misstatement amounts for the year before the misstatement begins (CLEANYR) and for the first year of the alleged misstatement (Year 1) through Year 3. The purpose of the analysis is to explore whether the accruals of the misreporting firms during the alleged misstatement period reflect optimistically biased expectations of future performance. Optimistic bias is a necessary element of the slippery slope story because optimism leads to an increased likelihood that the manager intentionally overstates

earnings in later years and thus to an increased likelihood of an AAER. Optimism can result in *unintentional* misstatements because managers with greater optimism about future performance will naturally generate more positive accruals. The accruals will turn out to have been overstated ex post based on realized income, but ex ante they reflect an optimistic bias, not intentional deception, as the manager believes his own assessment. Optimism can also result in *intentional* misstatements because optimistic managers are more willing to misstate earnings either because of an optimistic expectation that next year's earnings will cover the inevitable reversal or because of optimism about the probability that the misstatement will go undetected. In either case, after the initial misstatement, the manager is more likely to be in a position in which he must either reveal the initial overstatement or continue misstating in greater amounts.

We use information hand-collected from the AAERs and the restated financial statements in 10-K filings to determine the amount of annual misstatements and to reconstruct earnings excluding the misstatement (“unmanaged income”). In CLEANYR, unmanaged income is net income from Compustat. In Years 1, 2, and 3, unmanaged income equals net income less restatement amounts, if restatement amounts are available, and it is set to missing otherwise.⁸

We compare the patterns in unmanaged income for the misreporting firms to those of a sample of non-AAER firms matched on the basis of industry and firm size, measured as total assets as of the end of the year before the earnings misstatements began (CLEANYR). We insure that each matched firm is itself not the subject of an AAER during the misstatement period. Matching on industry attempts to control for the degree to which managerial judgment can influence revenue recognition and over/understatement of assets and expenses. Matching on size is important because size has been shown to be correlated with SEC scrutiny (Beneish,

⁸ The sample size in Year 3 decreases substantially as many of the cases do not extend to a third year. Information on Year 3 is provided for descriptive purposes and should be interpreted with caution due to the small sample size.

1999). This procedure generates a match at the four-digit level with total assets within 10% for 19 of the 36 firms. We match at the three-digit level (two-digit level) for 13 (4) of the firms.⁹

Table 2 first presents a comparison of unmanaged income for the misreporting firms and the matched sample in CLEANYR, before the misstatements begin (first row of Panel A, Columns 1 - 3). The median income for the misreporting sample is significantly lower than for the matched sample in raw dollars (11 vs. 13 million, as reported in Panel A). Net income scaled by total assets, however, is not significantly different (untabulated). The similarity suggests that the match controls for performance as of the year preceding the alleged misstatement period.

Panels B and C indicate that the misreporting and matched sample firms have similar declines in performance subsequent to CLEANYR. From CLEANYR to Year 1, the misreporting firms have a median decline in unmanaged income of 38% (Panel B). The matched sample firms exhibit a similar decline during this period (31%). In subsequent periods, the misreporting firms appear to have greater declines in performance than the matched sample but the differences are not significant. Thus, it does not appear that the misreporting firms simply realized a series of bad draws on *unmanaged* income relative to the matched sample. Rather, the similar declines in unmanaged performance suggest that the misreporting firms were more optimistic than the matched sample firms in Year 1 in terms of *reported* earnings.

The evidence in Panel D shows that the dollar amount of the misstatement escalates each period. The median amount increases by 18% between the first and second year and by another

⁹ An *ex post* assessment of the quality of the match indicates CLEANYR stock returns are not significantly different. Measures of financial health (i.e., the debt-equity ratio, whether the firm had three or more losses in the six years prior to the case, the current and quick ratios, interest coverage ratio, book-to-market ratio, sales growth, return volatility, and unexpected earnings-per-share) are not significantly different, with the exception of two measures (S&P long-term domestic credit rating is different in mean and median while earnings-price ratio is different in median only). The firms also are not different in free cash flow, acquisition activity, and debt issuances in CLEANYR as measures of their external financing demands. The only significant difference between the samples related to external financing is that the misreporting firms issue more equity and are younger firms (both are significant in medians but not means).

26% between the second and third year. This result is consistent with the slippery slope scenario. The misreporting firms chose to misstate earnings in greater amounts to cover reversals and to maintain the optimistic expectations previously created. These increasing misstatement amounts were eventually detected, leading to the AAERs.

In summary, the patterns in unmanaged earnings and the misstatement amounts reported in Table 2 suggest greater optimism in reported earnings at the misreporting firms. One explanation for the greater observed optimism in reported earnings is that the executives at the misreporting and matched firms are equally optimistic, but better monitoring constrains the ability of the matched firm executives such that they are unable to reflect their optimism in reported earnings. We explore this explanation in Section 2.2, comparing monitoring across the misreporting and matched firms. A second, non-mutually exclusive, explanation is that the executives at the misreporting firms are more overconfident than those at the matched sample, leading to greater optimistic bias. We explore this explanation in Section 3.

Table 2 also provides evidence on the patterns in unmanaged earnings and misstatements for the fraud sample (Columns 4 and 5). The patterns for the fraud firms are distinct from those of misreporting firms. The median fraud firm exhibits a large decline in unmanaged income of 143% in Year 1 (Panel B). However, the median fraud firm's unmanaged income decreases by only 4% from Year 1 to Year 2 and increases by 13% from Year 2 to Year 3. The percent of fraud firms with losses declines from Year 1 to Year 2 (Panel C). Also in contrast to the misreporting firms, the misstatement amount does not show an increasing pattern (Panel D). In summary, the fraud firms continue to misstate earnings despite a turnaround in performance. This pattern is distinct from that of the misreporting firms that initially misstate earnings in a year of poor performance and then increase the misstatements in growing amounts as

performance continues to decline, as the slippery slope story suggests. The fraud firms instead initially misstate earnings in a year with particularly poor performance and then continue to misstate even after the decline in performance has leveled off and performance improves.

2.2. Analysis of monitoring mechanisms

We compare commonly studied proxies for monitoring at the misreporting and the matched sample firms. The purpose of the analysis is to investigate whether the observed bias in reported earnings for the misreporting firms relative to the matched sample (Table 2) occurs because the managers at the misreporting firms are not as well monitored. The proxies, measured in the period of the initial misstatement, include block ownership, board size, board composition, and measures of the entrenchment and busyness of the inside, outside, and gray board members.

Table 3 presents the results.¹⁰ The analysis is on a small sample and uses crude proxies for monitoring that may or may not capture the sorts of governance mechanisms that would detect and prevent misstatements ([Larcker, Richardson, and Tuna, 2007](#); [Armstrong, Guay, and Weber, 2010](#); [Brickley and Zimmerman, 2010](#)). However, conditional on these caveats, we do not find evidence of a difference in the monitoring across the misreporting and matched sample firms with the exception of weak evidence on the role of outside directors (Table 3).¹¹

We are reluctant to draw conclusions about the role of monitoring based on a no-results finding in a small sample test. Nonetheless, the *lack* of correlation between the monitoring measures and misreporting is more consistent with the scenario that executives at the misreporting firms are more optimistic than those at the matched sample firms. It is not

¹⁰ The monitoring characteristics of the fraud firms are presented for completeness.

¹¹ The outside directors of the misreporting firms have a greater number of additional directorships than the matched sample (i.e., they are more busy), opposite to the finding of Beasley (1996).

consistent with the alternative explanation that the executives are equally optimistic but that better monitoring at the matched sample firms mitigates the adverse effects of executive optimism on financial reporting decisions.

3. Analysis of accused executives

In this section, we compare proxies for the optimistic bias of executives at the misreporting and matched sample firms. The purpose of the analysis is to investigate whether the source of the bias in reported earnings for the misreporting firms (Table 2) is managerial overconfidence, which is associated with an optimistic bias in decision making ([Weinstein and Klein, 1996](#)). Overconfidence is a prevalent characteristic of executives and entrepreneurs,¹² and research has documented an association between overconfidence and overly optimistic judgments in corporate investment, financing, and managerial forecasting decisions (e.g., [Malmendier and Tate, 2005](#); [Ben-David, Graham, and Harvey, 2007](#); [Malmendier, Tate, and Yan, 2007](#); [Hirshleifer, Low, and Teoh, 2010](#); [Hribar and Yang, 2011](#)). We examine compensation proxies first (Section 3.1) followed by non-compensation proxies (Section 3.2).

The AAERs identify 134 accused employees of the 36 misreporting sample firms. Of these, 75 are executives who appear in proxy statements and for which we can get executive-level data. Thirty of the 36 AAER firms involve at least one executive. We are able to find a reasonable match for 70 of the 75 executives from the misreporting sample using executives at the respective matched sample firm.¹³ There are 32 accused executives of the fraud sample firms

¹² See Englmaier (2004), Heaton (2002), and Schultz and Zaman (2001) for surveys of the evidence.

¹³ The misreporting sample contains 17 CEOs, 16 of which are matched to CEOs. The misreporting sample contains 24 financial executives (CFOs, controllers, chief accounting officers, VP-finance, or other financial titles), 22 of which are matched to similarly titled financial executives. Board membership was not a requirement for matching. Nonetheless, of the 37 misreporting firm executives that are on the board of directors (BOD), 21 match to executives on the match firm's BOD. Of the 12 misreporting firm executives that are BOD chairs, eight match to executives that are BOD chairs.

for which we can obtain data. We also create another sample of “fraudulent” executives that includes only the specific executives named in the AAERs, rather than assuming that all of the executives at a firm involved in a fraud case were equally culpable. This classification defines 40 accused executives as fraudulent based on executive-specific allegations of ill-gotten gains, primarily from insider trading. There is overlap in the two samples of fraudulent executives. Eleven of the 13 fraud cases, classified as such because of allegations and penalties at the *firm* level, name at least one specific respondent that must personally disgorge funds.

3.1. Analysis of compensation

We examine compensation-related proxies for overconfidence separately from the other proxies because compensation, in addition to being a proxy for overconfidence as described below, can also create incentives to misstate earnings. The severity of this potential problem is not clear, however, because empirical evidence on the relation between compensation and both AAERs and restatements is mixed ([Dechow, Sloan, and Sweeney, 1996](#); [Burns and Kedia, 2006](#); [Efendi, Srivastava, and Swanson, 2007](#); EHM; [Johnson, Ryan, and Tian, 2009](#)). When we interpret the results on the relation between compensation and AAER propensity, we take into account the potential for compensation to provide greater incentives to misstate earnings.

The justification for compensation as a proxy for overconfidence is derived from models of optimal contracting with overconfident executives. [de la Rosa \(2008\)](#) predicts that “significant” levels of overconfidence are associated with higher incentive pay because of the manager’s distorted preference for success-based pay given his unrealistic expectations about success, but “slightly” overconfident executives require lower incentive pay because less is necessary to induce effort. [Gervais et al. \(2010\)](#) similarly predict that “mildly” overconfident

executives require less convexity in an optimal contract as some overconfidence reduces the classic principal-agent conflict and better aligns a manager's incentives with those of shareholders, but "extremely" overconfident executives require more convexity.

In order to make predictions about the association between compensation as a proxy for overconfidence and misreporting based on these models, we must first make a distinction between moderate and extreme overconfidence. If the source of optimistic bias is moderate overconfidence, which de la Rosa (2008) and Gervais et al. (2010) refer to as slight and mild, respectively, then these models suggest that executives at the misreporting firms have *lower* variable pay and *less* convexity than the matched sample executives. However, if the source is extreme overconfidence, which they refer to as significant and extreme, respectively, then these models suggest that executives at the misreporting firms have *higher* variable pay and *more* convexity than the matched sample executives. We believe the interpretation of "extreme" overconfidence in these two models is more consistent with the trait of narcissism than of overconfidence. Narcissism is, in fact, sometimes discussed as an extreme form of overconfidence ([Post, 1993](#); [Campbell, Goodie, and Foster, 2004](#)), but a distinguishing feature of a narcissist is "self-love" and a need for attention.¹⁴ Thus, we rely on the models' predictions for moderate levels of overconfidence and predict a *negative* relation between incentive pay and misreporting cases. In contrast, we predict a *positive* association between incentive pay and the fraud cases, recognizing that the self-love aspect of narcissism is consistent with the self-serving behavior that the SEC alleges motivates some misstatements (i.e., the frauds).

¹⁴ In the context of corporate management, narcissistic leadership occurs "... when leaders' actions are principally motivated by their own egomaniacal needs and beliefs, superseding the needs and interests of the constituents and institutions they lead" (Rosenthal and Pittinsky, 2006, p. 629). See Bollaert and Petit (2009), who provide a recent review of how overconfidence and narcissism (as well as hubris) are considered in the academic literature.

The models that lead to the above predictions do not consider the effect of the contract on the manager's incentives to misstate earnings. If the managers at the fraud firms are extremely overconfident and therefore have more variable pay, as predicted, the greater incentives to misstate earnings due to the compensation contract will *exacerbate* their greater tendency to misstate due to their overconfidence. In contrast, if the managers at the misreporting firms are moderately overconfident and thus predicted to have compensation contracts that provide lower incentives to misstate, the incentives will *offset* the executive's tendency to overstate earnings due to his optimistic bias. The offsetting effects could prevent us from finding the predicted relation. However, as noted at the beginning of this section, the extent of the offsetting relation is unclear because the evidence on the association between misstatements and compensation-related incentives is mixed.

We report comparisons of two compensation variables: salary (LOGSALARY) and bonus (LOGBONUS) measured as of CLEANYR. Appendix A provides details on construction of these (and all other) variables. The misreporting executives have significantly lower fixed cash compensation (LOGSALARY) and variable compensation (LOGBONUS) than executives in the matched sample (Table 4, Panel A).¹⁵ This difference is consistent with more overconfident executives at the misreporting firms based on the models that predict that moderate levels of overconfidence are associated with lower incentive pay because less is necessary to induce effort.¹⁶ The misreporting firm executives also have significantly lower incentive pay than the fraud firm executives when defined at the individual level (Panel C).

¹⁵ EHM find no relation between AAER propensity and equity incentives of the top five managers of the firm. We also examine this relation using only the executives cited in the AAERs and their respective matches and similarly find no results. We do not tabulate these results due to the small sample size arising from limiting the sample to only cited executives and requiring that the variables be available for both the cited executive and the respective matched executive.

¹⁶ Results are similar for variable cash compensation (bonus) scaled by total cash pay.

Greater variable pay for the fraud executives is consistent with them being extremely overconfident individuals who overvalue variable compensation such that they prefer it to other forms of compensation.

3.2. Analysis of executive characteristics other than compensation

In this section we examine characteristics of the executives. The characteristics have been associated with overconfidence in the psychology literature or used in more recent studies of the association between overconfidence and corporate financial decisions. The motivation for each variable is described below. Before we describe the characteristics, it is worth noting that the causality of the association is generally ambiguous. For example, while prior research documents an association between education and overconfidence, it is not clear whether overconfidence leads individuals to attain greater education levels or whether education leads to overconfidence. However, the direction of causality is not relevant to this study as long as the proxy variable measures the degree of an executive's overconfidence at the time of the misstatement, and its determinants are not correlated with the propensity for an AAER.

Our first set of variables measure whether the executive is a member of the founding family and his tenure with the firm. A robust finding in the psychology literature is that the greater the perceived controllability of an event, the greater the tendency to exhibit optimistic bias ([Weinstein and Klein, 1996](#)). Two other common themes are that individuals are more likely to be overconfident about the outcomes or the risk of a project when they have a personal stake in it and that overconfident individuals attribute successes, especially recent successes, to ability, while attributing failures to bad luck. Founding family status and tenure are meant to

capture a sense of controllability, personal stake, and self-attribution ([Bernardo and Welch, 2001](#), and the cites therein; [Puri and Robinson, 2005](#); [Hirshleifer et al., 2010](#)).

We consider an executive a founder (FOUNDER) if the executive is a founder, co-founder, or member of the founding family. We measure an executive's tenure with the firm (TENURE) as a continuous variable equal to the number of years between the executive's start date at the firm and the first year of the fraud. Because firm age varies within the samples, we also measure tenure as the proportion of the firm's life during which the executive was employed (COMMIT).¹⁷

Table 4 Panel A shows that the misreporting firm executives are not significantly different in founding family status compared to the matched firm executives. They have significantly shorter tenures in total (TENURE) and as a percent of the firm's life (COMMIT). Assuming longer tenure is associated with greater overconfidence, the shorter tenure for the misreporting firms is opposite to the prediction that greater overconfidence is associated with optimism that leads to misreporting. Panels B and C report that executives at fraud firms have a longer tenure with the firm and are more likely to be from a founding family. One explanation for these contrasting results across the misreporting firms and the fraud firms is that these proxies for overconfidence – founding family status and tenure – characterize extreme, but not moderate, levels of overconfidence.¹⁸

Our second set of executive variables proxies for expertise. Experts tend to be more overconfident than novices (e.g., [Griffin and Tversky, 1992](#)). Intuition might suggest that

¹⁷ *COMMIT* equals 1 for executives who are with the firm at the time of listing, for which *COMMIT* would have been greater than 100%. When we cannot determine the exact start year, we substitute the earliest year that we could determine the executive was with the firm. We made this substitution, which will create an understatement of tenure levels, to maximize available observations. The results are not sensitive to this substitution.

¹⁸ [Dechow et al. \(1996\)](#) also examine the relation between AAERs and founding family status, but measure founder status for the firm, not for the executive involved in the misstatement. Interpretation of their results, therefore, is confounded by the potentially offsetting incentives of a founder to misreport and to monitor misreporting by others.

experts would exhibit more realistic expectations, but the offsetting force is that their expertise causes them to believe they are better than average at a task. We include several proxies for expertise. Consistent with evidence in [Puri and Robinson \(2005\)](#) and [Ben-David et al. \(2007\)](#), we include the executive's level of education (EDUCATION) using a discrete variable that measures the highest level of education attained (No college (0); Bachelor's degree (1); Master's degree (2); two Master's degrees (2.5); Doctorate degree (3)). A separate indicator variable (MBA) equals one if the executive has an MBA or Master's of Finance. We also include indicators for whether the executive is (or was) a CPA or AUDITOR.¹⁹ These proxies yield limited evidence that experts are associated with the likelihood of misreporting.²⁰

The next two executive characteristics are gender and age. Men are more overconfident than women in general contexts, and empirical evidence documents this phenomenon specifically for investing decisions (e.g., [Barber and Odean, 2001](#); [Estes and Hosseini, 2001](#)). We make no predictions about executive age as the empirical evidence on the relation between age and optimism is mixed (e.g., [Puri and Robinson, 2005](#); [Grinblatt and Keloharju, 2001](#); [Malmendier and Tate, 2005](#); [Ben-David et al., 2007](#)). We find no indications of differences in age or gender across the misreporting and matched executives. The lack of difference in age between the two samples suggests that the COMMIT and TENURE variables are not affected by differences in horizon concerns and also confirms the lack of difference in expertise. [Feng et al. \(2011\)](#) similarly document no significant age differences across CFOs involved in frauds.

¹⁹ In untabulated analysis, we further classify 103 of the 107 executives based on whether the AAER suggests the executive orchestrated the fraud (73 executives), participated in the fraud (23), or was reckless in not knowing about the fraud (7). The executives who are cited as "reckless" are high level executives (board chairs, CEOs or CFOs), CPAs, and executives with audit experience. It appears that the SEC expects board chairs, CEOs, CFOs, and managers with financial expertise to detect the significant misstatements in the AAERs. The orchestrators are less likely to be CPAs or auditors, which suggests that the accountant does not direct the fraud, but his participation is necessary to achieve it.

²⁰ Our results for CPAs are inconsistent with [Feng, Ge, Luo, and Shevlin \(2011\)](#), who find that CFOs at AAER firms are more likely to be CPAs than are CFOs at non-AAER firms.

As additional evidence in support of differential overconfidence, untabulated univariate analysis of employee headcount patterns also suggests that the executives at the misreporting firms were more optimistic than those at the matched sample firms. The misreporting firms increase their employee headcount in the face of declining performance. Specifically, the median percent increase in the number of employees for the misreporting firms is 28% (8%) in CLEANYR (Year 1) relative to only 11% (6%) for the matched firms. Similarly, only 28% of the misreporting firms decrease the number of employees during Year 1, relative to 40% for the matched sample.

In summary, the compensation and non-compensation proxies for overconfidence provide mixed results. Our primary finding in support of differential overconfidence levels between the two samples is that the executives at the misreporting firms receive less variable compensation than the matched sample executives. This result is consistent with the scenario in which the executives at the misreporting firms have greater overconfidence, and hence more optimistic bias, relative to the matched sample executives. This finding is particularly informative because the misstatements occur despite the weaker incentives to commit fraud as a result of less performance-based pay. The non-compensation proxies for overconfidence, however, do not differ as predicted between the two samples.

We make two observations that could explain the mixed evidence across the compensation and non-compensation proxies for overconfidence. First, because compensation is an endogenous outcome of the contract negotiation process, the compensation proxies may capture cross-sectional variation in executive type better than the non-compensation variables. Indicators such as education, CPA status, and gender may be noisy measures of the type of moderate overconfidence associated with misreporting. Second, there is some evidence that

founding family status and commitment explain the fraud cases suggesting these variables may proxy for extreme rather than moderate overconfidence that is associated with misreporting.

4. Supplemental analysis of the overconfidence explanation

While the analysis of the unmanaged earnings and misstatement amounts provides fairly robust evidence that the misreporting firms exhibit an optimistic bias that begins the slippery slope to an AAER, our evidence that overconfident managers are the source of the optimistic bias is mixed. In this section, we use two additional samples to examine the association between AAERs and proxies for overconfidence as an indicator of optimistic bias. In Section 4.1, we present an analysis of firms in the software and hardware industries. In Section 4.2, we present an analysis of a sample of firms that spans all industries from 1989 to 2001 (the “broad sample”). These larger sample tests allow for multiple regression analysis and alternative proxies for overconfidence. One caveat to these tests is that the dependent variable is whether a firm has an AAER, which includes both misreporting and fraud cases. This leads to measurement error in our dependent variable (AAERs) as a proxy for misreporting and noise in the analysis.

4.1. High-tech sample analysis

The first additional sample we examine to test for a relation between overconfidence and AAER propensity includes all firms in the hardware and software industries meeting our data requirements (the “high-tech” sample). This sample has several advantages. First, prior studies document industry concentrations of AAERs in high-tech industries and speculate that their activities provide greater opportunities to misstate earnings ([Dechow et al., 1996](#); [COSO, 1999](#); [Bell and Carcello, 2000](#)). Second, these industries have a large number of publicly held firms

making data to measure the overconfidence proxies readily available. Finally, these firms are not subject to a high degree of external constraints or regulations, which allows for greater variation in managerial characteristics such as overconfidence (Chatterjee and Hambrick, CH, 2007), increasing the power of the tests *ceteris paribus*.

We estimate a logistic model of AAER propensity for the high-tech sample as a function of proxies for executive overconfidence and control variables:

$$AAER_{it} = \alpha + \beta OC_{it} + \Psi CONTROL_{it} + \varepsilon_{it} \quad (1)$$

The high-tech sample used to estimate equation (1) is constructed following the procedures in CH. The initial sample contains 111 CEOs across 107 firms in primary SIC codes 737 and 357 that have a CEO who began his tenure after 1990 and has a minimum of four years tenure with the firm. We have data available to estimate equation (1) for 92 of the 107 firms.²¹

The logistic model contains one observation for each of the 92 sample firms. The dependent variable (AAER) equals one for the eight firms that have AAERs during the period 1992 to 2004 and equals zero otherwise. We calculate the overconfidence variables and the control variables as the average of the values during the second and third year of the CEO's tenure to avoid the effects of transition years, consistent with CH.

The variable of interest in equation (1) is the proxy for overconfidence (OC) that indicates greater optimism, and is predicted to have a positive association with AAER propensity if greater executive optimism increases the likelihood that a firm starts down the slippery slope. We measure overconfidence using two versions of an executive-level overconfidence score that uses a subset of the five indicators of narcissism examined by CH in their study of the relation between narcissism, acquisition activity, and firm performance.

²¹ We lose seven firms due to missing accounting data and eight firms because we are unable to locate a copy of the annual report to code the photoscore (discussed below).

While CH suggest that their five indicators measure narcissism, several could also be interpreted to measure overconfidence. The first indicator, relative cash compensation (REL_CASHCOMP) equals the ratio of the CEO's salary plus bonus to that of the second highest paid executive, averaged over the second and third year of the CEO's tenure. The second indicator, relative non-cash compensation (REL_NONCASH) is similarly measured using total compensation from Execucomp (TDC1) less cash compensation.²² CH suggest that these relative pay measures are indicators of narcissism because the CEO has substantial influence over his own pay, and over the pay of other executives in their companies (p. 364). However, if relative pay, especially between the CEO and other top executives, is explained by a tournament style of within-company promotion as in Lambert, Larcker, and Weigelt (1993), then higher relative pay could be a source of overconfidence for the executive, causing him to believe he is better than average. Our first overconfidence score, OC_PAY, is equal to the sum of the standardized values of these two overconfidence indicators, REL_CASHCOMP and REL_NONCASH, where we standardize each variable such that it has a mean of zero and standard deviation of one.

Our second overconfidence score extends the OC_PAY score to include a third indicator of overconfidence from CH based on the prominence of the CEO's photograph in the annual report (PHOTOSCORE). The photoscore equals four points if the CEO's photo in the annual report includes no other individuals and is at least a half page in size; three points if the CEO's photo includes no other individuals and is less than a half page in size; two points if there are other individuals pictured with the CEO; and one point if there is no photograph of the CEO. CH suggest that a CEO has significant influence over his portrayal in the annual report based on discussions with three communications specialists. However, if the external party that designs a

²² Results are qualitatively consistent with an alternative relative non-cash proxy measured using the Black Scholes value of options granted.

firm's annual report plays a significant role in the annual report composition, then the prominence would be a source of overconfidence to the CEO. This second overconfidence score (OC_PAY&PHOTO) is equal to the sum of the standardized values of the two relative compensation variables from the first score plus the photoscore.²³

The model includes six control variables based on research that proposes determinants of AAER propensity (Beasley, 1996; COSO, 1999; and EHM). We include firm size, measured by assets (LOGASSETS), to control for a potential positive correlation between size and SEC scrutiny (Beneish, 1999) and between size and resources available to control fraud (Ashbaugh-Skaife, Collins, and Kinney, 2007; Doyle, Ge, and McVay, 2007).²⁴ These two forces have opposite predictions for the relation between size and AAER propensity in the model. We include sales growth (SALESGRO) and book-to-market ratios (BKMKT) to control for misstatement incentives associated with greater external financing demands of growth firms. We include free cash flow (FCF) and profitability (ROA) to control for pre-misstatement performance that can also affect a firm's incentives to misstate earnings. Finally, we include the firm's debt to equity ratio to control for financial health, consistent with EHM. None of the control variables are consistently significant in the regressions.

Table 5 presents the results. The first two columns show that both of our overconfidence scores, OC_PAY and OC_PAY&PHOTO, are positively and significantly associated with the probability of an AAER. An analysis of the individual score components in Column (3) suggests that the relative pay variables explain most of the variation in AAER propensity.

²³ The two indicators from CH that we do not use are the CEO's prominence in the firm's press releases and the CEO's use of first-person singular pronouns in speeches. CH provide compelling support for the claim that these two indicators are under the CEO's control and thus reflect an outcome of narcissism as a distinct trait from overconfidence. We do not include these variables as they are less likely to reflect the overconfidence trait.

²⁴ Results are consistent using alternative measures of firm size including 1) total sales and 2) the log of the sum of the market value of common equity, book value of preferred stock, and the book value of long-term debt.

In untabulated analysis, we also include several of the proxies for monitoring that were used in Section 3 including variables that measure whether the CEO is the chairman of the board, the percent of inside directors, director entrenchment, and director busyness. The coefficient estimates on these variables are not significantly different from zero and the results on our variables of interest remain consistent.

In summary, using the setting of high-tech firms and alternative proxies for overconfidence, we find evidence in support of a positive association between AAERs and executive overconfidence. This finding is consistent with our hypothesis that optimistic bias, which is associated with the trait of overconfidence, increases the likelihood that a firm goes down the slippery slope to misreporting.

4.2. Broad sample analysis

The second additional sample we examine to test for a relation between overconfidence and AAER propensity includes firms from all industries between 1989 to 2001 (the “broad” sample). We estimate a logistic model of AAER propensity as a function of overconfidence proxies as well as compensation and control variables for a panel of firm-year observations:

$$AAER_{it} = \alpha + \beta OC_{it} + \Omega COMP_{it} + \Psi CONTROL_{it} + \varepsilon_{it} \quad (2)$$

The sample used to estimate equation (2) contains all firms on Compustat with available data for the period 1989 through 2001. Firms that have an AAER during this time period are included in the model only in the first year of the alleged misstatement, and AAER equals one in that year. For the non-AAER firms, the dependent variable equals zero in all years. We identify AAER firms from the database compiled by [Dechow et al. \(2011\)](#), in which all of the alleged cases begin between 1989 and 2001.

The model includes one of three firm-level proxies for managerial overconfidence (OC), compensation-related variables (COMP), and variables identified in prior literature that attempt to control for the incentives and opportunities to misreport (CONTROL), each described below. All of the independent variables are measured for year $t - 1$ for non-AAER firms and the year prior to the first year of the alleged misstatement for the AAER sample. Standard errors are clustered by firm and fiscal year.

4.2.1. Proxies for overconfidence

The first proxy for executive overconfidence, measured at the firm-level, is an indicator variable based on the option exercising behavior of the CEO. Malmendier and [Tate \(2005, 2008\)](#) suggest that the extent to which a CEO delays exercising options reflects his or her degree of overconfidence. Managers, who are generally heavily invested (both in human capital and wealth) in their firm, are expected to exercise their options (and presumably exchange them for cash) at the earliest point in time that the options are both vested and in-the-money. Delaying the exercise of fully vested in-the-money options is interpreted as evidence that the manager systematically overestimates the value of the firm relative to the market.²⁵ The Malmendier and Tate measure is available only through 1994 and proprietary data is required to create it for later periods. Thus, we measure the delay as the natural log of the value of the CEO's in-the-money unexercised but exercisable options (OPTIONDELAY) similar to the measure used by Li, Minnis, Nagar, and Rajan (2009). OPTIONDELAY is similar in concept to the Malmendier and Tate measure, but it can be estimated using publically available data. If the delay is greater than

²⁵ For example, consistent with evidence provided by Ben-David et al. (2007) and Malmendier and [Tate \(2005\)](#), overconfident managers are more likely to overestimate the returns to their investment projects.

the 3-digit industry median, the firm is more likely to have overconfident executives and OC_OPTIONS equals 1.²⁶

When using OC_OPTIONS as a proxy for overconfidence, we also include the log of the executive's total holdings in the firm inclusive of options and stock holdings (LOGHOLDINGS) as a control variable. It is possible that the delay in option exercise is mechanically related to the CEO's total holdings in the firm. As recognized by Malmendier and Tate (2005), while overconfident executives often choose to hold more stock, stock holdings are not a meaningful proxy for overconfidence given insufficient cross-sectional variation.

The second proxy for overconfidence is a firm-specific score that is constructed using four measures of firm-level investing and financing activities that prior research has found to be related to managerial overconfidence (OC_FIRM4). This proxy assumes that overconfident executives are consistently optimistic across decision contexts and infers overconfidence from an executive's other decisions. We are able to construct the score for a larger sample because it requires only firm-level Compustat data; we do not need data on executive option holdings. If at least two of the four input measures indicate that the firm is more likely to have an overconfident executive, then OC_FIRM4 is equal to 1.

The first component of the score is industry-adjusted excess investment, which is the firm's residual from a regression of total asset growth on sales growth less the industry median residual (XSINVEST_INDADJ). Ben-David et al. (2007) document excess investment on average by overconfident executives consistent with the prediction that overconfident managers overestimate the cash flows of an investment project and/or underestimate the risk of the payoffs. Malmendier and Tate (2005) find that overconfident executives (over)invest more when internal

²⁶ We industry adjust the variable to control for industry variation in compensation practices. We also use the continuous specification of this variable (OPTIONDELAY) both with and without industry-adjusting and the results using these continuous specifications are consistent with the reported results.

resources are sufficient to fund investment but curtail investment when external resources are required. Excess investment greater than the industry median (i.e., XSINVEST_INDADJ greater than zero) for that year indicates overconfidence.

The second component of OC_FIRM4 is the industry-adjusted net dollars of acquisitions made by the firm, obtained from the statement of cash flows (ACQUIRE_INDADJ). With respect to merger and acquisition activity, Malmendier and Tate (2008) find that overconfident executives are both more likely to overpay and to engage in value destroying acquisitions. Acquisitions by the firm in excess of the industry median for the year suggest overconfidence.

The third component of OC_FIRM4 is the firm's industry-adjusted debt-to-equity ratio, equal to long-term debt scaled by the market value of the firm, less the industry median for the year (DERATIO_INDADJ). Heaton (2002) generates predictions of standard pecking order preferences by overconfident managers. Hackbarth (2008) generates the same prediction if overconfidence causes an optimistic assessment of investment payoffs but a reverse pecking order preference if overconfidence causes an optimistic assessment of the firm's cost of capital to fund investment. A debt to equity ratio greater than the industry median indicates overconfidence ([Malmendier et al, 2007](#); Ben-David et al., 2007).

The fourth component of the score is an indicator variable equal to one if the firm uses either convertible debt or preferred stock (RISKYDT). Ben-David et al. (2007) predict that firms with overconfident managers will choose risky debt, and find evidence that overconfident executives have longer debt duration as a measure of risky debt.

Finally, we extend OC_FIRM4 to incorporate overconfidence reflected in a fifth indicator, the firm's dividend policy. Ben-David et al. (2007) suggest that overconfident executives are less likely to pay dividends in order to preserve cash to fund anticipated

investment opportunities. We measure a firm's dividend yield (DIVYLD), and assume that firms with a dividend yield equal to zero are more likely to have overconfident executives. OC_FIRM5 equals 1 if the firm exhibits three or more of the five firm-level indicators of overconfidence.²⁷ We treat dividend policy separately because it can proxy for firm characteristics as well as overconfident executives. It is possible that the same issue applies to the debt-equity ratio, although industry-adjusting the debt-equity ratio mitigates this problem given the tendency toward an industry norm (Hull, 1999).

The firm-level investing and financing activities that are used as proxies for overconfidence could be associated with weaker governance. We cannot separate the effects of overconfidence from governance on AAER propensity. However, we note that optimistic bias combined with weak governance is necessary for the slippery slope pattern to hold. Weak governance allows an executive's inherent bias (i.e., optimism) to more easily influence the financial reporting.

The overconfidence scores (OC_FIRM4, OC_FIRM5, and OC_OPTIONS) measure overconfidence at the firm level, not for a specific executive at the firm. We mitigate noise associated with the firm-level measurement of these variables by limiting the sample to AAER firms with at least one executive officer involved. This restriction results in a sample of 167 firms with AAERs that have the required data to estimate equation (1). There are 53,275 non-AAER firm-year observations.

Table 6 provides descriptive statistics for the AAER and non-AAER firms. Panel A reports results for the full sample with available Compustat data, and Panel B reports results for

²⁷ In sensitivity analysis, we include a count variable that ranges from 0 through 4 (or 5) indicating how many of the firm-level characteristics indicate overconfidence. The results are consistent with those using our indicator variable. We also include each of the levels separately. We generally find that the fewer indicators of overconfidence, the lower the coefficient and the lower the significance.

the more limited sample for which we have proxy data to compute OC_OPTIONS. In the full sample, a higher proportion of AAER firms are classified as having more overconfident executives using both the OC_FIRM4 and OC_FIRM5 measures (61% and 53%, respectively), compared to the non-AAER executive teams (47% and 39%). The components of the scores that differ across the samples as predicted are excess investment (XSINVEST_INDADJ), acquisitions (ACQUIRE_INDADJ), and dividend yield (DIVYLD). Comparisons are similar for the subsample with Execucomp data (Panel B).

The option-exercise-based proxy for overconfidence (OC_OPTIONS) classifies 67% (45%) of the AAER (non-AAER) observations as having overconfident executives based on the significantly higher continuous measure of the delay in exercising in-the-money exercisable options. By comparison, Malmendier and Tate (2005) classify 34% of their sample firms as overconfident (58 out of 171) based on the primary overconfidence variable (Holder 67).²⁸

Untabulated analysis indicates that OC_FIRM4 and OC_FIRM5 are highly correlated. The correlation of the sums of the four and five input variables is 91% and the correlation of the indicator variables is 84%. Correlations of OC_FIRM4 and OC_FIRM5 with OC_OPTIONS are lower (about 7-8%), although significant (p -values <0.01). In addition, the five individual firm-level variables load up intuitively on two factors. DERATIO_INDADJ and RISKYDT load positively on one factor, while DIVYLD loads negatively and XSINVEST_INDADJ and ACQUIRE_INDADJ load positively on the other.

4.2.2. *Compensation and control variables*

²⁸ Malmendier and Tate (2005) compute Holder 67 as an indicator for a CEO that holds or has held an option that is more than 67% in-the-money by year 5 under the assumption that if a vested option is more than 67% in-the-money, the CEO should have exercised at least some portion of it by year 5. Not exercising at least some portion the option is their primary indicator of the CEO's overconfidence.

The three compensation proxies (COMP) included in the logit model for the broad sample are fixed compensation (LOGSALARY), variable cash compensation (LOGBONUS) and option compensation (LOGOPTION).²⁹ As discussed in Section 2, variable pay based on earnings outcomes is a potential source of incentives to commit fraud. At the same time, theory predicts that moderate levels of overconfidence are associated with lower variable pay because less is required to induce effort ([de la Rosa, 2008](#)). Including the compensation variables mitigates the concern that coefficient estimates on our overconfidence proxies reflect compensation incentives rather than the marginal effect of overconfidence. Table 6, Panels A and B, show that fixed compensation is weakly greater for the AAER firms and that variable cash compensation is significantly greater. Option compensation is not statistically different.

The broad sample logistic model in equation (2) includes five control variables for determinants of AAER propensity that were described in the high-tech sample analysis: firm size (LOGASSETS), sales growth (SALESGRO), book to market ratios (BKMKT), free cash flow (FCF), and profitability (ROA). For both the larger (Panel A) and smaller (Panel B) samples, the AAER firms are larger and have significantly higher sales growth. Median, but not mean, free cash flow (FCF) is significantly lower for the AAER firms in both samples.

4.2.3. *Logit model results*

Table 7 reports the results of the logit analysis. Columns (1) through (3), which exclude the compensation variables to maximize sample size, show a positive correlation between each of the proxies for overconfidence and the probability of an AAER. Untabulated analysis

²⁹ These compensation variables are distinct from the OPTIONDELAY variable used to define the OC_OPTIONS proxy. OPTIONDELAY measures the timing of option exercise rather than the level of compensation. The correlations between the OPTIONDELAY variable and the compensation controls are 0.22, 0.28, and 0.37 for LOGSALARY, LOGBONUS, and LOGOPTION, respectively. The compensation variables are also distinct from the variables used in the high-tech analysis to measure relative pay.

indicates that the explanatory power of OC_FIRM4 is primarily related to the excess investment and acquisition components of the score. Similarly, the explanatory power of OC_FIRM5 is related to excess investment, acquisitions, and dividend payouts.

As for the control variables, the positive relation between firm size and AAER propensity is not consistent with the prediction that larger firms are less likely to misstate earnings because they have greater resources available to control misstatements (COSO, 1999; Ashbaugh-Skaife et al., 2007; [Doyle et al., 2007](#)). The positive relation is instead consistent with two possible explanations: 1) size is positively related to SEC scrutiny and creates a selection bias when using AAERs as a proxy for misstatements ([Beneish, 1999](#)), and 2) size is positively correlated with opportunities or incentives to misstate that are not being captured by the other control variables. The signs of the coefficient estimates on the other control variables, when significant, are consistent with our predictions.

The positive association between growth and AAER propensity, evidenced by the positive coefficient estimate on SALESGRO in all models and the negative coefficient estimate on BKMKT in Columns (2) and (3) that use the larger sample, is consistent with the prediction that greater external financing needs create greater incentives to misstate earnings. The negative association between the propensity for AAERs and both ROA and FCF when significant, is consistent with the prediction that weaker pre-misstatement performance is associated with increased AAER propensity.

Columns (4) through (6) add the compensation control variables. The three overconfidence proxies remain significant explanatory variables for AAERs. Thus, the effect of overconfidence on AAER propensity is incremental to any effect of compensation-related

incentives that might be correlated with overconfidence. Further, these models suggest the relation between overconfidence and AAERs holds in the smaller sample of larger firms.

5. Conclusion

Our detailed analysis of a sample of 49 firms with AAERs suggests two distinct explanations for the misstatements. Just over one quarter of the cases represent many of the well-publicized examples of corporate fraud including Adelphia, Enron, Healthsouth, and Tyco. The nature of the misstatements, their timing, and an analysis of the executives suggest that the activities are consistent with a strong inference of intent on the part of the respondent and consistent with the legal standards necessary to establish fraud.

However, perhaps more surprising, we find that the actions by the executives in the remaining three quarters of the cases are not consistent with the pleading standards required to establish an intent to defraud. Rather, our analysis of the 49 AAER firms suggests that optimistic bias on the part of executives can explain these AAERs. We show that the misstatement amount in the initial period of alleged misreporting is relatively small, and possibly unintentional. Subsequent period earnings realizations are poor, however, and the misstatements escalate. Using a matched sample of non-AAER firms, we show that the misreporting firms did not simply get a bad draw on earnings. Nor does it appear that weaker monitoring relative to the matched sample explains why the misreporting manager's optimistic bias affects the financial statements. We further examine whether the optimistic bias for the misreporting firms is associated with the character trait of overconfidence. The evidence from the analysis of the 49 AAER sample is mixed on this question. However, we find evidence of a positive association between proxies for overconfidence and the propensity for AAERs in two larger samples that use

alternative measures of overconfidence. The association between overconfidence and AAERs is consistent with the slippery slope explanation in which greater optimistic bias makes it more likely that a manager is in the position that significant misreporting is an optimal choice.

An interesting question raised by the analysis is the importance of monitoring the optimistic bias of executives. Various models predict that overconfidence has desirable effects on the executive's performance (Goel and Thakor, 2000; [Gervais and Goldstein, 2007](#); Gervais et al., 2010). Our analysis indicates overconfidence can be associated with financial reporting concerns and prior work has documented an association between overconfidence and distorted investment and financing decisions (e.g., Malmendier and Tate, 2005 and 2008 among others). For firms who value the positive aspects of overconfidence, a plausible response is to put mechanisms in place to monitor the executive's decision-making biases associated with this trait. This response is feasible only if the Board recognizes executive overconfidence. Our evidence indicating that the misreporting firms and matched sample of non-AAER firms have different compensation arrangements suggests that the Board is able to do so at some level. However, our corresponding analysis of monitoring does not indicate that the overconfident managers were better monitored, which explains why they were more likely to end up misreporting. The potential for monitoring to moderate the optimistic bias that characterizes executives remains an interesting open question. Is it that our analysis does not adequately capture the specific mechanisms that would control optimistic bias? Or, is the cost of better monitoring higher than the expected benefits from mitigating the risk of misreporting, which is a significant but unusual event?

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Appendix A: Variable definitions

Overconfidence proxies: (All industry adjustments are made at the 3-digit SIC level)

Broad sample analysis

OC_OPTIONS	= 1 if OPTIONDELAY is greater than the industry median, 0 otherwise.
OC_FIRM4	= 1 if the firm meets the requirements of at least 2 of 4 criteria following, 0 otherwise. 1) XSINVEST_INDADJ greater than zero; 2) ACQUIRE_INDADJ greater than zero; 3) DERATIO_INDADJ greater than zero; and 4) RISKYDT equal to one.
OC_FIRM5	= 1 if the firm meets the requirements of at least 3 of 5 criteria, 0 otherwise. 1-4 are the same as for OC_FIRM4 and 5) DIVYLD is equal to zero.
OPTIONDELAY	= log of in-the-money unexercised exercisable options held by the CEO, equal to $\text{opt_unex_exer_est_val}$, +.01.
XSINVEST_INDADJ	= residual from a regression of total asset growth on sales growth, adjusted for the industry median.
ACQUIRE_INDADJ	= net acquisitions from the statement of cash flows, adjusted for the industry median.
DERATIO	= debt to equity ratio (long-term debt (data9) plus short-term debt (data34), scaled by the total market value of the firm). The total market value equals the sum of the market value of equity plus the book values of long-term debt and preferred stock.
DERATIO_INDADJ	= DERATIO, adjusted for the industry median.
RISKYDT	= 1 if either convertible debt (data39) or preferred stock (data130) is greater than zero, 0 otherwise.
DIVYLD	= dividend yield, equal to dividends per share (data26) divided by share price (data199) for the firms that pay dividends, 0 otherwise.

High-tech sample analysis

OC_PAY	= the sum of the standardized values (mean zero, standard deviation one) of REL_CASHCOMP and REL_NONCASH. Each proxy is the average value over the second and third years of the CEO's tenure.
OC_PAY&PHOTO	= OC_PAY plus the standardized value of PHOTOSCORE.
REL_NONCASH	= ratio of non-cash CEO compensation to that of the second highest paid executive. Non-cash compensation equals total compensation (TDC1) less cash compensation from ExecuComp.
REL_CASHCOMP	= ratio of CEO salary plus bonus to that of the second highest paid executive, from Execucomp.
PHOTOSCORE	= four points if the CEO's photo in the annual report included no other individuals and was at least one half page in size; three points if the CEO's photo included no other individuals and was less than one half page; two points if there were other individuals pictured with the CEO; and one point if there was no photograph of the CEO.

Detail sample analysis

FOUNDER	= 1 if the executive is a founder or co-founder of the firm, or is part of the founding family, 0 otherwise.
TENURE	= number of years between the executive's start date at the firm and the first year of the fraud.
COMMIT	= TENURE scaled by the age of the firm, using the firm start year on CRSP. If the executive was with the firm prior to the public listing (and start year on CRSP), this variable is 1.
EDUCATION	= highest level of education an executive obtained, equal to 0 if the executive did <i>not</i> attain a college degree, 1 Bachelor's degree, 2 Master's degree, 2.5 two Master's degrees, or 3 JD or PhD.
MBA	= 1 if executive holds a MBA or Master's of Finance, 0 otherwise.
CPA	= 1 if the executive holds a CPA (or CPA equivalent from another country), 0 otherwise.
AUDITOR	= 1 if the executive worked as an external auditor, 0 otherwise.
FEMALE	= 1 if the executive is a female, 0 if male.
AGE	= executive's age in the first year of the fraud.

Appendix A (continued)

Governance Variables:

Blockholders:

BH_IND	= 1 if the proxy identifies at least one blockholder, 0 otherwise.
BH_NUM	= Number of reporting persons identified in the proxy statement who are the beneficial owners of more than 5% of the common stock outstanding as defined under Section 13(d) of the Securities Exchange Act of 1934, as amended.
BH_PCT	= Percent of common shares held by identified blockholders.

Board characteristics:

BDSIZE	= Number of directors on the board.
CEOCHAIR	= An indicator variable = 1 if the CEO is the chair, 0 otherwise.
AUDITCOMM	= An indicator variable = 1 if the board has an audit committee, 0 otherwise.
PERCENT	= Percentage of directors of the noted type.
ENTRENCH	= An indicator variable = 1 if the director served more than 5 years or 100% of the firm's life (AVGTEN% = 1), 0 otherwise.
AVGTEN%	= Average tenure on the board in years from the first year of the directorship to the meeting date (as per IRRC) scaled by firm age (truncated at 1) for directors of the noted type.
AVGBUSY	= Average number of other directorships held by directors of the noted type.

Compensation variables:

LOGSALARY	= Natural log of salary + .01.
LOGBONUS	= Natural log of bonus + .01.
LOGOPTION	= Natural log of the Black Scholes value of option grants awarded as defined by Execucomp.
LOGHOLDINGS	= for the CEO, equal to the sum of in-the-money unexercised options – both exercisable and unexercisable (opt_unex_exer_est_val + opt_unex_unex_est_val) + shares owned (shrown_excl_opts * prccf).

Control Variables:

LOGASSETS	= Natural log of total assets (data6).
SALESGRO	= one-year percentage change in sales (data12) for the year prior to the fraud.
BKMKT	= book-to-market ratio, equal to the book value of equity (data60) divided by the total market value of the firm. The total market value of the firms is equal to the sum of the market value of equity (data199*data25) plus the book value of long-term debt (data9+data34) plus the book value of preferred stock (data130).
FCF	= free cash flow (data308) in year t less average capital expenditures (data128) of the three years prior to year t, scaled by current assets (data4) at t-1.
ROA	= return on assets, equal to net income (data172) divided by total assets (data6).

Table 1. Summary of alleged misstatement activities in the AAERs

Summary of the alleged misstatement activities for the sample of 49 cases. The column labeled “Occurred” indicates the percent of cases in which the SEC alleges that a particular type of earnings (or balance sheet) management occurred. The column labeled “Primary” indicates which of the activities we identified as the most significant activity based on the AAER discussions. Panel A describes the misstatement activities and Panel B describes the firms’ alleged goals. * indicates the Fraud Sample is significantly different from the Misreporting Sample at the 5% level using a Wilcoxon rank-sum test of unmatched samples.

	All AAERs (49)		Misreporting Sample (36)		Fraud Sample (13)	
	Occurred	Primary	Occurred	Primary	Occurred	Primary
Panel A: Misreporting activity						
Revenue recognition						
Premature	53.1%	28.6	55.5	33.3	38.5	15.4
Fictitious	38.8	16.3	33.3	13.9	53.9	23.1
Unclear	18.4	-	19.4	-	15.4	-
Any type	65.3	44.9	66.7	47.2	61.5	38.5
Overstate assets	24.5	8.2	19.4	8.3	38.5	7.7
Other income increasing	46.9	16.3	41.7	16.7	61.5	15.4
Capitalize expenses	22.5	6.1	16.6	5.6	30.8	7.7
Create (or use) hidden reserves	20.4	8.2	19.4	11.1	15.4	-
Off-balance sheet financing	6.1	6.1	2.8	2.8	15.4	15.4
Improper income statement classification	18.4	2.0	19.4	2.8	15.4	-
Illegal transactions ³⁰	6.1	-	2.8	-	15.4	-
Related party	16.3	4.1	8.3	-	38.5*	15.4*
Panel B: Goals						
Increase income	79.6%		80.6		76.9	
Smooth income	6.1		8.3		-	
Hide debt off-balance sheet	6.1		2.8		15.4	

³⁰ Falsifying documents, which is alleged in many revenue recognition cases, is not classified as an illegal transaction.

Table 2. Time patterns in unmanaged income and misstatement amounts

Panels A and B show unmanaged income and changes in unmanaged income for the misreporting firms, the matched sample, and the fraud firms. The periods shown are the year prior to the alleged fraud (CLEANYR) and the first three years of the fraud, (Year1, Year2, and Year3), if the fraud extended that long. For all years for the matched sample firms, and for CLEANYR for the misreporting and fraud firms, unmanaged income equals net income. For the misreporting and fraud firms in Year 1, Year 2, and Year 3, unmanaged income is restated net income if restatement amounts are available and it is missing otherwise. Panel C reports the percent of firms with negative unmanaged income (LOSS FIRMS). Panel D reports median percent changes in net income restatements (i.e., misstatement amounts) from Year 1 to Year 2 and from Year 2 to Year 3. The p-values of differences in medians between the misreporting firms and the matched sample are for a two-sided Wilcoxon sign-rank matched pair test. The p-values of differences in medians between the misreporting firms and the fraud firms are for a two-sided Wilcoxon rank-sum test. For binary variables, p-values are for a χ^2 test.

	Misreporting sample		Matched sample	Difference	Fraud sample		Difference
	(1)				(2)	(3)	
	N	Value	Value	p-value	N	Value	p-value
Panel A: Unmanaged (restated) income, in millions							
CLEANYR	35	11	13	0.03	13	13	0.94
Year 1	24	2	6	0.05	8	-35	0.10
Year 2	19	0	9	0.04	7	9	0.93
Year 3	6	2	11	0.46	4	-12	0.52
Panel B: % growth in unmanaged (restated) income							
CLEANYR - Year1	24	-38%	-31%	0.23	8	-143%	0.11
Year 1 – Year 2	18	-51%	36%	0.20	6	-4%	0.46
Year 2 – Year 3	6	-68%	11%	0.46	3	13%	0.44
Panel C: LOSS FIRMS							
CLEANYR	35	26%	14%	0.06	13	23%	0.85
Year 1	24	42%	29%	0.94	8	63%	0.31
Year 2	19	53%	16%	0.47	7	43%	0.66
Year 3	6	33%	17%	0.44	4	75%	0.20
Panel D: % change in restatement amounts							
Year 1 – Year 2	21	18%			6	71%	0.52
Year 2 – Year 3	9	26%			4	23%	0.76

Table 3. Comparison of monitoring mechanisms

Comparison of proxies for monitoring across the misreporting firms, the matched firms, and the fraud firms. Definitions of the variables are provided in Appendix A. Bolded values are significantly different from the misreporting sample at the 10% significance level. The p-values of tests of differences in the medians across the samples are for a two-sided Wilcoxon rank-sum test. For binary variables, significance is based on p-values of a χ^2 test.

	Misreporting sample		Matched sample		Fraud sample	
	Mean	Median	Mean	Median	Mean	Median
	N = 23		N = 23		N=10	
<i>Blockholders:</i>						
BH_IND	69.57%	1	69.57%	1	80.00%	1
BH_NUM	1.74	2	1.96	2	1.30	1.5
BH_PCT	19.63%	18.40%	19.32%	18.80%	12.94%	12.94%
<i>Board characteristics:</i>						
BDSIZE	8.65	8	7.91	7	8.70	8
CEOCHAIR	82.61%		78.26%		80.00%	
AUDITCOMM	86.96%		82.61%		80.00%	
<i>Board composition:</i>						
PERCENT: Inside	26.18%	23.21%	22.63%	20.00%	22.77%	16.23%
Gray	20.52%	15.48%	14.52%	11.11%	14.22%	9.17%
Outside	53.30%	58.57%	62.86%	66.67%	63.01%	58.57%
ENTRENCH: Inside	68.18%		77.27%		88.89%	
Gray	94.12%		78.57%		40.00%	
Outside	76.19%		75.00%		88.89%	
AVGTEN%: Inside	49.47%	50.00%	64.88%	65.38%	68.91%	100%
Gray	62.47%	100%	76.66%	83.33%	32.58%	33.33%
Outside	54.86%	55.00%	58.40%	51.67%	54.00%	46.67%
AVGBUSY: Inside	1.00	0.00	0.64	0.00	1.19	0.2
Gray	1.19	0.50	1.12	0.20	0.85	0.88
Outside	1.71	1.73	1.23	1.25	1.44	1.42

Table 4. Comparison of executive characteristics

This table presents means (medians of continuous variables) of characteristics of accused executives at the misreporting firms, the matched sample, and the fraud firms. Panel A presents statistics for the 75 executives of the misreporting sample and matched sample firms. Panel B presents statistics for the 32 accused executives at the fraud firms and significance tests comparing them to the misreporting sample. Panel C presents statistics for the 40 specific executives with AAER allegations of insider trading or self-serving compensation and significance tests comparing them to the misreporting sample. Definitions of the variables are provided in Appendix A. For continuous variables, significance is based on p-values of t-tests of differences in the means assuming equal variances unless equality is rejected at 10% level or on p-values of two-sided Wilcoxon rank-sum tests of differences in the medians. For binary variables, significance is based on p-values of a χ^2 test. Significance levels are indicated by ***, **, and * representing 1%, 5%, and 10%, respectively.

	Panel A: Misreporting sample vs. matched sample			Panel B: Fraud sample defined by SEC allegations against the firm		Panel C: Fraud sample defined by SEC allegations against the executive	
	Misreporting	Matched		Fraud		Fraud	
Max N	75	70		32		40	
LOGSALARY	5.47 (5.40)	5.66 (5.54)	** **	5.94 (5.71)	*** ***	5.88 (5.71)	*** ***
LOGBONUS	1.22 (3.20)	3.62 (5.11)	** **	1.33 (5.46)		2.97 (5.24)	** ***
FOUNDER	10.67	7.14		28.13	*	25.00	*
TENURE	4.90 (3)	9.75 (6)	*** ***	8.75 (8)	*** ***	7.95 (5)	** **
COMMIT	55.63 (58.57)	72.88 (100.00)	** **	82.15 (100.00)	*** ***	68.39 (100.00)	
EDUCATION	1.50 (1)	1.56 (1)		1.73 (1)		1.82 (2)	*
MBA	25.00	30.00		20.83		27.27	
CPA	33.96	24.14		24.14		19.35	*
AUDITOR	23.40	15.25		14.81		10.71	
FEMALE	0	2.86		3.13		2.5	
AGE	48.44 (49)	49.36 (49)		46.69 (45)		47.55 (46.5)	

Table 5. Models of AAER likelihood for the high-tech sample

Estimation of logit models of AAER likelihood for a sample of firms in the software (SIC 737) and hardware (SIC 357) industries (“high-tech sample”). The dependent variable is an indicator equal to 1 if the firm was accused of financial misstatements in an AAER between 1992 and 2004 and is equal to zero for all non-AAER firms in that period. OC_PAY is the sum of the standardized values of the two relative pay proxies (REL_CASHCOMP and REL_NONCASH). REL_CASHCOMP (REL_NONCASH) is the ratio of salary plus bonus (non-cash compensation) for the CEO to that of the second highest paid executive, averaged over the second and third years of the CEO’s tenure. OC_PAY&PHOTO equals OC_PAY plus the standardized value of PHOTOSCORE as a third proxy for executive overconfidence. PHOTOSCORE measures the executive’s prominence in the annual report. The model is estimated using a logit regression, with standard errors clustered by year. Control variables are winsorized at 5%. Definitions of the independent variables are provided in Appendix A. Significance levels are indicated by ***, **, and * representing 1%, 5%, and 10%, respectively, one-tailed if predicted and two-tailed otherwise.

		1=AAER firm 0=Non-AAER		
Intercept		-5.738**	-6.442**	-6.269***
<i>Proxies for overconfidence:</i>				
OC_PAY	+	0.551***		
OC_PAY&PHOTO	+		0.573***	
<i>OC_SCORE components:</i>				
REL_CASHCOMP	+			0.464*
REL_NONCASH	+			1.177***
PHOTOSCORE	+			0.368
<i>Control variables:</i>				
LOGASSETS		0.410	0.444	0.458
SALESGRO		0.495	0.644	0.536
BKMKT		1.871	2.940*	2.625
FCF		1.344	1.978	1.806
ROA		1.715	1.515	1.813
DERATIO		-23.035*	-24.731**	-26.693
N		92	92	92
Pseudo R2		21.61%	22.95%	23.58%
Wald χ^2 test statistic		230.83	173.21	319.02
Wald χ^2 p-value		0.00	0.00	0.00

Table 6. Descriptive statistics of variables used in the broad sample tests

Univariate statistics for the variables used in the broad sample regressions. Panel A presents statistics for 53,442 firm-year observations including 167 AAER firm-years (i.e., the first year that the firm was accused of a financial misstatement in an AAER) and 53,275 non-AAER firm-years (i.e., all firm-years for firms that were not alleged to have misstated). Panel B presents statistics for 11,183 firm-year observations for which the overconfidence variables based on option exercise behavior are available, including 46 AAER firm-years and 11,137 non-AAER firm-years. Variable definitions are provided in Appendix A. The p-values of differences in medians between the AAER firms and the matched sample are for a two-sided Wilcoxon sign-rank matched pair test. For binary variables, significance is based on p-values of a χ^2 test.

Panel A: Full sample of 53,442 firm-years (167 AAER years and 53,275 non-AAER years)

	AAER firm-years (AAER=1)					Non-AAER firm-years (AAER=0)					p-values	
	Mean	Median	Min	Max	StDev	Mean	Median	Min	Max	StDev	Mean	Median
<i>Overconfidence:</i>												
OC_FIRM4	0.61	1.00	0.00	1.00	0.49	0.47	0.00	0.00	1.00	0.50		0.00
OC_FIRM5	0.53	1.00	0.00	1.00	0.50	0.39	0.00	0.00	1.00	0.49		0.00
XSINVEST_INDADJ	1.15	0.18	-0.63	9.13	2.37	0.30	0.00	-0.75	9.13	1.28	0.00	0.00
ACQUIRE_INDADJ	26.35	0.00	-9.59	413.65	72.73	13.36	0.00	-9.59	413.65	55.91	0.00	0.00
DERATIO_INDADJ	0.02	0.00	-0.25	0.47	0.14	0.04	0.00	-0.25	0.50	0.16	0.07	0.19
RISKYDT	0.25	0.00	0.00	1.00	0.44	0.28	0.00	0.00	1.00	0.45		0.48
DIVYLD	0.00	0.00	0.00	0.08	0.01	0.01	0.00	0.00	0.09	0.02	0.00	0.02
<i>Compensation:</i>												
LOGSALARY (*)	6.20	6.21	4.79	7.24	0.66	6.09	6.11	4.20	7.24	0.53	0.14	0.19
LOGBONUS (*)	4.99	6.02	-4.61	7.96	3.56	3.56	5.42	-4.61	7.96	4.28	0.02	0.00
LOGOPTION (*)	4.87	6.18	0.00	9.88	3.61	4.49	5.74	0.00	9.89	3.28	0.43	0.27
<i>Control Variables:</i>												
LOGASSETS	5.10	5.01	0.31	9.81	2.13	4.47	4.38	-0.47	9.81	2.17	0.00	0.00
SALES GRO	0.59	0.25	-0.58	6.34	1.13	0.26	0.09	-0.92	6.34	0.87	0.00	0.00
BKMKT	0.51	0.38	0.00	4.32	0.53	0.65	0.48	0.00	4.32	0.66	0.01	0.00
FCF	-0.17	-0.08	-5.02	1.16	0.60	-0.15	0.01	-5.02	1.16	0.76	0.68	0.00
ROA	-0.11	0.03	-2.93	0.31	0.46	-0.11	0.03	-2.93	0.31	0.44	0.80	0.83

(*) The compensation control variables (LOGSALARY, LOGBONUS, and LOGOPTION) are available for 10,434 firms (46 fraud and 10,388 non-AAER)

Table 6. (continued)

Panel B: Subsample of 11,183 firms with the option exercise-based overconfidence data (46 alleged AAER years and 11,137 non-AAER years)

	AAER-years (AAER=1)					Non-AAER firm-years (AAER=0)					p-values	
	Mean	Median	Min	Max	StDev	Mean	Median	Min	Max	StDev	Mean	Median
<i>Overconfidence:</i>												
OC_OPTIONS	0.67	1.00	0.00	1.00	0.47	0.45	0.00	0.00	1.00	0.50		0.00
OC_FIRM4	0.76	1.00	0.00	1.00	0.43	0.56	1.00	0.00	1.00	0.50		0.01
OC_FIRM5	0.55	1.00	0.00	1.00	0.50	0.38	0.00	0.00	1.00	0.49		0.02
OPTIONDELAY	7.26	7.89	0.00	11.28	3.48	5.14	6.25	0.00	11.28	3.69	0.00	0.00
XSINVEST_INDADJ	0.27	0.06	-0.23	2.11	0.52	0.15	0.00	-0.75	9.13	0.75	0.32	0.01
ACQUIRE_INDADJ	68.63	13.80	-9.59	413.65	120.92	41.83	0.00	-9.59	413.65	98.58	0.07	0.00
DERATIO_INDADJ	0.00	-0.01	-0.24	0.33	0.12	0.02	0.00	-0.25	0.50	0.14	0.56	0.76
RISKYDT	0.33	0.00	0.00	1.00	0.47	0.31	0.00	0.00	1.00	0.46		0.81
DIVYLD	0.01	0.00	0.00	0.05	0.01	0.01	0.00	0.00	0.09	0.02	0.04	0.12
<i>Compensation:</i>												
LOGSALARY (*)	6.22	6.21	4.79	7.24	0.65	6.11	6.13	4.20	7.24	0.54	0.14	0.20
LOGBONUS (*)	4.96	6.02	-4.61	7.98	3.55	3.61	5.46	-4.61	7.98	4.28	0.03	0.00
LOGOPTION (*)	5.10	6.24	0.00	9.89	3.60	4.58	5.81	0.00	9.89	3.28	0.29	0.17
LOGHOLDINGS	10.09	10.32	2.02	13.79	2.32	9.02	9.12	2.02	13.79	2.09	0.00	0.00
<i>Control Variables</i>												
LOGASSETS	7.39	7.01	5.01	9.81	1.56	6.86	6.75	1.23	9.81	1.47	0.02	0.05
SALESGRO	0.39	0.21	-0.41	4.41	0.69	0.18	0.10	-0.92	6.34	0.47	0.00	0.00
BKMKT	0.47	0.34	0.00	1.55	0.35	0.50	0.41	0.00	4.32	0.45	0.63	0.62
FCF	0.06	0.02	-0.38	1.10	0.27	0.10	0.11	-5.02	1.16	0.38	0.41	0.03
ROA	-0.01	0.04	-2.13	0.15	0.33	0.03	0.05	-2.93	0.31	0.18	0.13	0.17

(*) The compensation control variables (LOGSALARY, LOGBONUS, and LOGOPTION) are available for 11,069 firms (46 fraud and 11,023 non-AAER)

Table 7. Firm-level AAER prediction model for the broad sample

Models of the determinants of AAERs at the firm level during the period 1989 – 2001. The dependent variable is an indicator equal to 1 in the first year the firm was accused of misstatement in an AAER and is equal to zero for all non-AAER firms. The independent variables are measured in the year prior. Models (1) through (3) exclude the compensation variables and include alternative proxies for overconfidence. Models (4) through (6) add the compensation variables. The models are estimated using a logit regression with standard errors clustered by firm and fiscal year. Variable definitions of the independent variables are provided in Appendix A. Significance levels are indicated by ***, **, and * representing 1%, 5%, and 10%, respectively, one-tailed if predicted and two-tailed otherwise.

Dependent variable:		1 = AAER firm (YR1 of fraud in year t) 0 = non-AAER firm (no fraud in year t)					
		Without compensation controls			With compensation controls		
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		-9.2237***	-6.5376***	-6.5947***	-9.1149***	-7.3795***	-7.3396***
<i>Proxies for overconfidence:</i>							
	OC_OPTIONS +	0.6969***			0.6410**		
	OC_FIRM4 +		0.3996***			0.7567**	
	OC_FIRM5 +			0.4579***			0.4772*
<i>Compensation variables:</i>							
	LOGSALARY				-0.0236	-0.0238	-0.0287
	LOGBONUS				0.0707***	0.0907***	0.0928***
	LOGOPTION				-0.0165	-0.0086	-0.0117
	LOGHOLDINGS	0.2124***			0.2134***		
<i>Control variables:</i>							
	LOGASSETS	0.1691**	0.1350***	0.1489***	0.1433**	0.1956*	0.2351**
	SALESGRO	0.3235**	0.2362***	0.2288***	0.3395**	0.1751	0.1611
	BKMKT	0.1260	-0.3573**	-0.3547**	0.1747	-0.2916	-0.2772
	FCF	-0.3680**	-0.0246	-0.0215	-0.4119***	-0.4066***	-0.3993***
	ROA	-0.5144*	-0.1505	-0.1512	-0.5626*	-0.7460**	-0.7269**
N		11,183	53,442	53,442	11,069	10,434	10,434
Log likelihood		-285.09	-1,107.29	-1,106.06	-283.44	-284.56	-285.85
Wald χ^2 test statistic		98.41	88.22	82.42	331.70	120.96	194.67
Wald χ^2 p-value		0.00	0.00	0.00	0.00	0.00	0.00