

**The Impact of Disclosures of Internal Control Weaknesses
and Remediations on Investor-Perceived Earnings Quality**

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May 18, 2010

Acknowledgements: The authors are grateful for helpful comments from Michael Welker, Steven Salterio, Jean Bédard, William Scott, Hollis Ashbaugh-Skaife, Terry Shevlin, Sarah McVay, Pamela Murphy, Shiheng Wang, Xin Zhang, Liandong Zhang, Arthur Cockfield, anonymous reviewers of the Canadian Academic Accounting Association Annual Conference 2010 and of the Chinese Accounting Professors' Association of North America 2010 Conference, and workshop participants at Queen's University, Concordia University, the University of Waterloo, McGill University, the University of Saskatchewan, and Brock University. They thank Jeffery Doyle, Weili Ge, and Sarah McVay for sharing their sample of firms with material weaknesses in internal control. They thank Frank Ecker, Jennifer Francis, Irene Kim, Per Olsson, and Katherine Schipper for sharing their AQfactor data. They acknowledge financial support from the Social Sciences and Humanities Research Council of Canada (Grant No. 410-2007-0352), the Chartered Accountants of Ontario Professorship, the CA-Queen's Centre for Governance, and the Faculty Research Development Program at Concordia University.

The Impact of Disclosures of Internal Control Weaknesses and Remediations on Investor-Perceived Earnings Quality

Abstract

We hypothesize and find that firms making SOX-mandated disclosures of material weaknesses in internal control over financial reporting (ICOFR) exhibit lower investor-perceived earnings quality (IPEQ) than non-disclosers. We measure IPEQ using e-loading, a market-returns-based representation of earnings quality developed by Ecker et al. (2006). Firms do not exhibit decreases in IPEQ after initially disclosing material weaknesses, consistent with investors having anticipated ICOFR strength based on observable firm characteristics. However, firms exhibit increases in IPEQ after receiving their first clean audit reports confirming the remediation of previously disclosed weaknesses. This indicates that although investors do not find initial weakness disclosures to be incrementally informative, SOX motivates firms to remediate weak controls and provides a venue for credible remediation disclosures, enhancing investors' perception of financial reporting reliability. These findings are consistent with the existence of regulatory benefits associated with SOX's internal control disclosure and audit requirements.

Keywords: perceived earnings quality, internal control, material weakness, e-loading, Sarbanes Oxley Act, SOX 302, SOX 404

Data Availability: All data used in the paper are available from publicly available sources noted in the text.

JEL Classifications: M40, M41, M49, G34

1. Introduction

We investigate whether US firms' disclosures about internal control over financial reporting (ICOFR), mandated by the Sarbanes-Oxley Act of 2002 (SOX), are associated with levels of investor-perceived earnings quality (IPEQ) and with changes in IPEQ over time. We measure IPEQ using e-loading, a market-returns-based representation of accrual quality developed by Ecker, Francis, Kim, Olsson, and Schipper (2006). Our focus on associations between SOX-related ICOFR disclosures and *investor-perceived* earnings quality augments prior research that has focused on associations between ICOFR disclosures and earnings quality measures based on *reported* accounting numbers. Since investor confidence is perception-based, our focus is consistent with SOX's goal of enhancing investor confidence in the reliability of financial reporting.

We hypothesize and find that firms making SOX-mandated disclosures of material weaknesses in ICOFR exhibit lower IPEQ than firms not disclosing such weaknesses. On average, however, firms' initial disclosures of material weaknesses do not alter IPEQ. This finding is consistent with investors having inferred firms' ICOFR weaknesses in the absence of explicit SOX-mandated disclosures. We also hypothesize and find that firms making audited disclosures of the remediation of previously identified ICOFR weaknesses exhibit increases in IPEQ. This finding is consistent with SOX remediation disclosures achieving the regulatory aim of enhancing investors' perception of the reliability of financial reporting. Our interpretation of the results is that SOX motivates firms to remediate ICOFR weaknesses and provides a credible venue for remediation disclosures, thereby enhancing investor perceptions of the reliability of firms' financial reporting.

E-loading is an appropriate proxy for IPEQ in the SOX regulatory setting despite controversy in the literature over whether accrual quality is a market-priced risk factor (Core, Guay, & Verdi, 2008) because enhancing investors' perception of the reliability of firms' accounting information can increase investor participation in equity markets and improve the efficiency of capital allocation (Lev, 1988). These regulatory benefits can occur even in the absence of direct pricing or cost-of-capital effects.

The study proceeds as follows. Reviews of the institutional setting and prior research leading to the development of hypotheses occupy sections 2 and 3. Section 4 describes sample selection and outlines the research design. Section 5 presents the results of empirical tests. The sixth section concludes and discusses the implications of the findings.

2. Institutional background

2.1 SOX provisions relating to ICOFR

SOX (An Act to Protect Investors by Improving the Accuracy and Reliability of Corporate Disclosure) is cited as the most important US securities legislation since the 1930s (Prentice, 2007). Nicolaisen (2004), a former Chief Accountant of the US Securities and Exchange Commission (SEC), maintains that SOX's provisions related to ICOFR "have the greatest potential to improve the reliability of financial reporting." Auditing Standard (AS) No. 2 defines a firm's ICOFR as "a process designed ... to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles" (Public Company Accounting Oversight Board, 2004, paragraph 7).¹ Policymakers aimed to enhance financial reporting reliability and restore investor confidence by enacting SOX's internal control provisions in Sections 302 and 404 of the Act.

2.1.1 SOX Sections 302 and 404

SOX Sections 302 and 404 relate to ICFR: Section 302 requires senior management to evaluate internal controls quarterly and certify the effectiveness of ICFR in quarterly and annual financial statements. SEC interim rules regarding Section 302 are effective August 29, 2002, applying to all SEC filers.

Section 404 mandates that firms' annual reports contain management's evaluation of ICFR effectiveness at each fiscal year end; it also requires auditors to conduct annual audits of clients' ICFR and express opinions on the effectiveness of ICFR. Section 404 is effective for fiscal years ending on or after November 15, 2004. To date, however, Section 404's ICFR audit requirement only applies to accelerated SEC filers, a category of filers comprising public companies with a market capitalization of at least \$75 million.²

Sections 302 and 404 are the first widely applied legal requirements mandating public disclosure and audit of ICFR effectiveness. Before SOX, the Foreign Corrupt Practices Act of 1977, which was aimed at curbing bribes to foreign officials, required US public companies to maintain systems of internal controls to ensure that transactions were accurately recorded; however, US companies were not required to publicly disclose internal control deficiencies except in Forms 8-K filed after changing auditors (Krishnan, 2005).

2.1.2 Levels of ICFR deficiencies

AS No. 2 identifies three, increasingly serious levels of ICFR deficiencies: control deficiencies, significant deficiencies, and material weaknesses. A material weakness is "...a significant deficiency, or combination of significant deficiencies, that results in more than a remote likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected" (AS No. 2, paragraph 10).³ Sections 302 and 404 mandate only

material weakness disclosures; disclosures of the two less serious internal control deficiencies are voluntary. We focus on only material weakness disclosures to circumvent self-selection issues relating to voluntary disclosure (Doyle, Ge, & McVay, 2007b) and because material weaknesses are more likely to be associated with low IPEQ than the two less serious types of ICOFR deficiencies are.

2.2 *SOX compliance costs*

SOX internal control provisions have evoked criticism relating to allegedly excessive costs of complying with the new regulations. Section 404 is cited as "...the most expensive and most burdensome piece of Sarbanes-Oxley" (Atkins, 2005); the SEC (2003) initially estimated annual implementation costs to be about \$91,000 per firm but actual costs are much higher. According to a recent study (SEC, 2009a), firms' average out-of-pocket costs of complying with Section 404 are \$2.3 million even after 2007 when costs have fallen due to learning-curve economies and improved regulatory guidance. Besides incurring direct out-of-pocket compliance costs, firms incur opportunity costs when managerial attention is diverted from business issues to comply with complex SOX regulations (Bryan & Lilien, 2005; Solomon & Bryan-Low, 2004). Companies and business associations bemoan SOX compliance costs, appealing for amendments or abolishment of the requirements (Garrett & Adler, 2009; American Electronics Association, 2005; Financial Executives International, 2005). In view of the on-going cost/benefit debate, it is important to investigate whether there is evidence consistent with benefits associated with mandated ICOFR disclosures, as we do in this study.

3. Prior literature and hypothesis development

3.1 *Prior literature*

The disclosure of reliable internal control data pursuant to SOX has facilitated ICOFR research. In this section, we review the two streams of research that are most germane to our study: research on the association of ICOFR strength with earnings quality (focusing on accrual quality) and research on the association of ICOFR strength with firms' cost of equity.

3.1.1 Internal control and earnings quality

Among the many accounting numbers firms report, earnings constitute a premier source of firm-specific information (Francis, LaFond, Olsson, & Schipper, 2004). Investors, analysts, senior executives, and boards of directors see earnings as the most important item in public firms' financial reports (Degeorge, Patel, & Zeckhauser, 1999). Investors rely on earnings more than any other summary measures of firm performance (Biddle, Seow, & Siegel, 1995; Francis, Schipper, & Vincent, 2003; Liu, Nissim, & Thomas, 2002).⁴ Survey results indicate that managers see earnings as the key metric investors and analysts rely on to evaluate firm performance (Graham, Harvey, & Rajgopal, 2005).

Three studies of internal control and earnings quality are closely related to ours but focus on firms' earnings quality based on *reported* accounting numbers, in contrast to our focus on *perceived* earnings quality. Using a modified Dechow and Dichev (2002) accrual-quality model, Doyle, Ge, & McVay (2007b) find that firms disclosing material ICOFR weaknesses tend to exhibit lower accrual quality than non-disclosers. They describe low accrual quality as evidence of "poorly estimated accruals that are not realized as cash flows" (p. 1141). Ashbaugh-Skaife, Collins, Kinney, & LaFond (2008) and Bédard (2006) primarily use modified Jones (1991) abnormal-accruals models to derive proxies for accrual quality. Tracking weakness disclosers

over time, Bédard finds that abnormal accruals in weakness-disclosure years exceed those in pre-disclosure years. He sees this as evidence of higher accrual quality in weakness-disclosure years when managers are motivated by auditors or liability concerns to reverse inflated accruals that accumulated in prior years. Ashbaugh-Skaife et al. perform cross-sectional comparisons of weakness disclosers vs. non-disclosers and find that weakness disclosers exhibit higher abnormal accruals (lower accrual quality) than non-disclosers. They also find that when auditors confirm the remediation of previously reported ICOFR deficiencies, firms exhibit lower absolute abnormal accruals (higher accrual quality) than when they first reported ICOFR deficiencies.

We seek to augment the literature by investigating similar associations of ICOFR deficiencies with perceived earnings quality. Since investor confidence is perception-based, our focus on perceived earnings quality is consistent with SOX's goal of enhancing investor confidence in the reliability of financial reporting. Focusing on IPEQ is also consistent with the FASB's Conceptual Framework, in which reliability has long been among the qualitative characteristics of useful accounting information (Statement of Financial Accounting Concepts No. 2, 1980). Reliability and usefulness are at least partially perception-based.

3.1.2 Internal control and the cost of equity

Three studies report diverse results regarding the association of ICOFR strength with firms' costs of equity. Ashbaugh-Skaife, Collins, Kinney, & LaFond (2009) find that firms reporting internal control deficiencies tend to have significantly higher costs of equity than those with problem-free internal control systems. Ogneva, Subramanyam, & Raghunandan (2007) and Beneish, Billings, & Hodder (2008) report somewhat contradictory findings. Focusing on firms providing Section 404 internal control disclosures for the first time, Ogneva et al. do not find any association between internal control weaknesses and equity costs after controlling for firm

characteristics and analyst forecast bias. Beneish et al. find that firms reporting internal control deficiencies under Section 302 exhibit significant increases in equity costs but do not find any evidence of changes in the equity costs of firms filing under Section 404.

Our study is closely related to studies in this research stream in that it is directed at the same fundamental research question—whether internal control weaknesses are associated with greater information risk in the capital market. Given the diverse results in extant cost-of-equity studies, further research is needed to shed light on this issue. Our study extends the literature by focusing on IPEQ, a different manifestation of information risk. To the extent that enhancing IPEQ boosts investor participation in equity markets and improves allocational efficiency, regulators are interested in enhancing IPEQ even if doing so does not lower firms' costs of capital.

3.2 Hypothesis development

3.2.1 Association of ICOFR strength with IPEQ

Studies reviewed in Section 3.1 indicate that ICOFR strength is positively associated with earnings quality because ICOFR reduces information risk associated with reported earnings numbers. Weak ICOFR impairs firms' earnings quality in two ways: by introducing noise (imprecision) and by imparting bias in accounting numbers.

As to noise, weak ICOFR tends to trigger unintentional errors due to ineffective information systems, inadequate training, or lackadaisical managerial attitudes toward financial reporting. Unintentional errors stemming from weak ICOFR include inventory miscounting and mispricing, failure to record credit sales/purchases, imprecise bad debt estimates due to inadequate credit screening, inadequate inventory obsolescence allowances, and mistakenly capitalizing items that should be expensed and vice-versa; all of these errors directly impact

earnings and are likely to degrade earnings quality (Ashbaugh-Skaife, Collins, Kinney, & LaFond, 2008; Doyle, Ge, & McVay, 2007b; Bédard, 2006; Knechel, Salterio, & Ballou, 2007).

As to bias, weak ICFR affords fraud opportunities, facilitating intentional earnings management (Doyle, Ge, & McVay, 2007b; Ashbaugh-Skaife, Collins, Kinney, & LaFond, 2008). Managerial incentives to manipulate earnings include maximizing compensation (Healy, 1985), ensuring job security (Fudenberg & Tirole, 1995), influencing capital market pricing (Murphy, 1985; Rangan, 1998; Teoh, Welch, & Wong, 1998), and relaxing debt covenant constraints (Watts & Zimmerman, 1978) or regulatory constraints based on accounting numbers (Jones, 1991; Cahan, 1992).

Analytical accounting research germane to our hypotheses is predicated on the assumption that firms' equity investors perceive any diminution in information quality and are compensated for it. Holthausen and Verrecchia's (1988) model predicts that when investors observe firms' earnings, they revise their beliefs about firms' performance to a lesser degree when they perceive accounting earnings to be noisier (less precise). Analytical models developed by Easley & O'Hara (2004) and Lambert, Leuz, & Verrecchia (2007) imply that biased information contains a non-diversifiable component perceived and priced by investors. Our first hypothesis related to investor perceptions, stated in alternative form, is:

H1: Firms disclosing internal control material weaknesses (ICMW) exhibit lower IPEQ than firms not disclosing any internal control deficiencies (Non-ICD).

3.2.2 Severity levels of material weaknesses and their association with IPEQ

Investor perceptions of the impact of material weaknesses on financial reporting reliability are likely to vary with the severity of the deficiencies and the extent to which auditors can compensate for the deficiencies before firms issue their financial statements. Material ICOFR weaknesses include account-specific lapses, deficient revenue-recognition policies, lack of segregation of duties, inadequate training of accounting personnel, deficiencies in period-end reporting protocols, and careless senior management attitudes toward ICOFR (Ge & McVay, 2005). External auditors can often compensate for or audit around (in the auditing vernacular) account-specific ICOFR weaknesses by conducting substantive tests, thereby ensuring that the numbers reported in financial statements are reliable even when clients' ICOFR is weak (Simunic, 1980; Lu, Richardson, & Salterio, 2009). It is costly or impossible, however, for auditors to compensate for severe control weaknesses related to deficiencies in firms' overall control environment.

Moody's Investors Service expresses a view on the auditability of different types of internal control material weaknesses, and the implications for the credit ratings issued by the Service, as follows:

We are less concerned about material weaknesses that relate to controls over specific account balances or transaction-level processes. We refer to these material weaknesses as "Category A" material weaknesses. In most cases, we believe that the auditor can effectively "audit around" these material weaknesses by performing additional substantive procedures in the area where the material weakness exists. We expect to give companies reporting Category A material weaknesses the benefit of the doubt and not take any related rating action... Other material weaknesses relate to company-level controls such as the control environment or the financial reporting process. These material weaknesses, which we refer to as "Category B" material weaknesses, may result in us bringing a company to rating committee to determine whether a rating action is necessary. We are concerned about these material weaknesses because we question the ability of the auditor to effectively "audit around" problems that have a pervasive effect on a company's financial reporting. Also, Category B material weaknesses call into question not only management's ability to prepare accurate financial reports but also its ability to control the business. (Doss & Jonas, 2004, p. 1)

Consistent with Moody's skepticism about auditors' ability to compensate for severe company-level material ICOFR weaknesses, four audit partners and a senior audit manager participating in a study by Hammersley et al. (2008) cite examples of company-level weaknesses that are costly to audit. They include lack of key personnel, evidence of management overriding controls, integrity issues, inadequate financial statement closing procedures, and insufficient documentation or oversight to effectively vet transactions or adjusting entries. Hammersley et al. find that firms disclosing these less-auditable internal control weaknesses exhibit lower market returns measured over a three-day event window containing the disclosures.⁵ Doyle et al. (2007b) find that accrual quality is negatively associated with the presence of severe company-level material weaknesses but not with the presence of more auditable, account-specific material weaknesses.

We expect to observe similar associations between the two categories of ICOFR weaknesses and IPEQ. Therefore, our second hypothesis is stated in alternative form for company-level weaknesses and in null form for account-specific weaknesses:

H2: A. Firms disclosing company-level material weaknesses (CLMW) in internal control exhibit lower IPEQ than firms not disclosing any internal control deficiencies (Non-ICD).

H2: B. There is no difference in IPEQ between firms disclosing account-specific material weaknesses (ASMW) and firms not disclosing any internal control deficiencies (Non-ICD).

3.2.3 Within-firm IPEQ changes following material weakness disclosures

Verrecchia (2001) shows analytically that the disclosure of new information about firm value is expected to be associated with changes in the activities of utility-maximizing investors, resulting in changes in stock prices, trading volume, and market liquidity. Ecker et al. (2006) find that firms' e-loading deteriorates in years leading up to three events that are likely to be associated with poor earnings quality: earnings restatements, material lawsuits, and delisting due to bankruptcy. To the extent that ICOFR disclosures provide investors with new information concerning firms' earnings quality, we expect to observe increases (decreases) in IPEQ for firms announcing improvement (deterioration) in ICOFR relative to market expectations.

We expect that investors form rational expectations, on average, about firms' ICOFR based on observable firm characteristics before firms make SOX-mandated disclosures. Doyle et al. (2007a) and Ashbaugh-Skaife, Collins, & Kinney (2007) find that, compared with firms not disclosing any ICOFR deficiencies under Sections 302 and 404, those disclosing deficiencies tend to be smaller, younger, financially weaker, more complex, more rapidly growing, and more likely to be undergoing restructuring. To the extent that investors anticipate ICOFR deficiencies based on such firm characteristics, we do not expect IPEQ to change upon SOX-mandated disclosures. It is an empirical question whether, and to what extent, the disclosures convey new information to the market, so we state the third hypothesis in null form:

H3: Firms disclosing internal control material weaknesses experience no change in IPEQ.

3.2.4 Within-firm IPEQ changes following remediation disclosures

Although it is unclear on the basis of a priori arguments whether the initial ICOFR disclosures contain information that investors cannot glean from observing firm characteristics over time, we expect that the first audited disclosures of firms successfully remediating previously disclosed material weaknesses convey positive new information to investors. We expect that the initial disclosure of ICOFR deficiencies increases firms' net benefits (or decreases net costs) of remediating ICOFR deficiencies. Even if investors expect that firms will strive to remediate ICOFR deficiencies, however, it is uncertain when and to what extent firms can ameliorate ICOFR sufficiently to obtain clean audit reports. So, we expect that audited remediation disclosures are associated with investors positively revising their prior perception of firms' earnings quality. Our fourth hypothesis, stated in alternative form, is:

H4: Firms disclosing remediation of internal control material weaknesses exhibit increases in IPEQ.

4. Data, sample selection and research design

4.1 Data and sample selection

4.1.1 Data sources and preliminary screening

We begin with 1,210 sample firms provided by Doyle, Ge, & McVay (2007b).⁶ After searching Forms 10-K, 10-Q, and 8-K on 10KWizard.com for the phrases "material weakness" and "material weaknesses" during August 1, 2002 to October 31, 2005, they identify 1,210 firms disclosing at least one material ICOFR weakness. We obtain detailed coding data regarding

material weakness types from the authors directly. From Audit Analytics we glean firms' first disclosures of unqualified SOX 404 audit reports evincing remediation of material weaknesses.

Daily return data for *AQfactor*, used to calculate the IPEQ measure, come from Ecker et al. (2006).⁷ Data related to the Fama-French three-factor model come from French's on-line data library.⁸ Firms' daily market return data are from the Center for Research in Security Prices (CRSP) and companies' accounting data are from Compustat North America.

[Insert Table 1]

To ensure the accuracy of dates when firms initially disclose ICOFR material weaknesses, we compare event dates from Doyle et al. with dates obtained by directly searching Audit Analytics. We include sample firms disclosing ICOFR material weaknesses for the first time during August 1, 2002 to December 31, 2006. We then compare event dates of the Doyle et al. sample with those of the Audit Analytics sample.⁹ Table 1 presents details of the event-date verification process. As shown in Panel A, 242 of the 1,210 Doyle et al. firms are excluded from the sample because they lack identification information. Among the remaining 968 firms, 129 are not covered by Audit Analytics. Of the remaining 839 firms, 382 have the same event dates per Doyle et al. and per Audit Analytics and 457 have different dates. For the 457 firms with inconsistent dates, the difference between the Audit Analytics date and the Doyle et al. date ranges from -898 to 1,315 days, with the mean of 82 and the median of 26 days.¹⁰

In view of these event-date discrepancies, we verify the dates via 10K-Wizard.¹¹ For the 968 firms with required identification information, we search 10K-Wizard for all SEC filings containing the phrase "material weakness" or "material weaknesses" from 2001 to the event-dates provided by Doyle et al. and Audit Analytics. We peruse the filings to identify the earliest dates companies disclose material weaknesses in ICOFR. As Panel B of Table 1 shows, we remove ten of the 968 firms with erroneous identification information; we exclude another ten

because their first disclosure dates fall before August 2002 when SOX internal control provisions became effective. We do not find material weakness disclosures for four companies and therefore exclude them from the sample. This date verification process yields a 944-firm sample as a basis for identifying sub-samples available for testing our four hypotheses. Table 2 summarizes this sub-sample selection process.

[Insert Table 2]

4.1.2 H1 and H2 samples

For H1, 61 firms are excluded because they receive unqualified SOX 404 audit opinions during the three-quarter testing period, denoted as (0, +270), i.e., day 0 through day +270 in event-time. Day 0 is the date when a firm first discloses material weaknesses under SOX. As discussed in the next section about the study's research design, we require three quarters of daily stock return data to measure a firm's IPEQ after the firm's first disclosure of weaknesses. The 61 firms are excluded to avoid the possible confounding effect of favorable disclosures regarding remediation of weaknesses during the testing period. Of the remaining 883 firms, 147 are either not covered by the CRSP Daily Stock File or lack daily stock return data required by our tests (at least 100 daily returns in three quarters) and 27 lack the Compustat data needed to construct a matched sample, leaving 709 observations for H1 univariate tests. As 67 of the 709 firms lack data for control variables, 642 observations are available for H1 multivariate analysis.

The sub-sample available for testing H2 is similar except that one firm is excluded because it lacks the Doyle et al. code for material weakness type. This leaves subsamples of 708 firms for H2 univariate tests and 641 firms for multivariate tests. Among the 708 firms, 250 have company-level weaknesses and 458 have account-specific weaknesses. Among the 641 firms, 226 have company-level weaknesses and 415 have account-specific weaknesses.

4.1.3 H3 sample

For H3 testing, we again start with 944 eligible firms; for the reason discussed previously we exclude 61 firms receiving unqualified SOX 404 audit opinions during (0, +270). We exclude 120 firms disclosing *non-material* weakness deficiencies, such as significant deficiencies and control deficiencies, during (-270, 0) for the following reason. As discussed in the next section about research design, we test H3 by comparing firms' IPEQ three quarters before and three quarters after they first disclose ICOFR material weaknesses. We exclude the 120 firms to create a more powerful test, free from the possible dilutive effect of negative internal control disclosures that are similar to the first material weakness disclosure in nature but milder in severity. The data relating to firms' disclosure of any other internal control deficiencies except material weaknesses come from Audit Analytics. We exclude 147 firms not covered by the CRSP Daily Stock File or lacking adequate daily stock return data to conduct our tests. These procedures generate a final sample of 616 firms for H3 testing.

4.1.4 H4 sample

H4 rests on the maintained assumption that unqualified SOX 404 audit opinions signal remediation of previously disclosed ICOFR weaknesses. Assembly of the sub-sample for testing H4 again starts with the initial 944 firms. Referring to Audit Analytics, we identify firms receiving their first clean opinions during 2004-2006 after filing material weaknesses, eliminating 483 firms that do not receive such opinions. We exclude 57 firms because there are less than three quarters between when they first disclose weaknesses and when they reveal clean opinions. We also exclude 11 firms disclosing material weaknesses again under SOX 302 during the three quarters after receiving clean opinions. The research design choice to eliminate these 68 firms is consistent with using a full three quarters of daily stock return data before and after

remediation disclosures to estimate IPEQ in the pre-remediation and post-remediation. We exclude 77 firms receiving clean opinions after March 31, 2006 because *AQfactor* data are only available up to December 31, 2006. This ensures that sample firms have three quarters of post-remediation *AQfactor* data for the tests. After removing 15 firms that are not covered by the CRSP Daily Stock File or lack adequate daily stock return data, we retain 301 sample firms for H4 testing.

4.2 *Research design*

4.2.1 E-loading proxy for IPEQ

We use e-loading, a market-returns-based measure, to proxy for investor-perceived earnings quality (IPEQ). This measure was developed by Ecker et al. (2006). It is the slope coefficient obtained from a regression of a firm's daily excess returns in year T on a factor-mimicking portfolio capturing earnings quality, controlling for other factors known to affect excess returns (market risk premium, size, and book-to-market ratio). Researchers have recently begun using this measure to address research questions pertaining to IPEQ.

Chen, Shevlin, & Tong (2007) apply e-loading to investigate whether changes in IPEQ (which they refer to as “the pricing of financial reporting quality”) are associated with changes in firms' dividend policies. They find that dividend-initiating and dividend-increasing firms exhibit decreases in e-loadings, reflecting IPEQ improvements; dividend-decreasing firms exhibit increase in e-loadings, reflecting IPEQ declines. Their interpretation is that dividend initiations and increases signal increased stability of current earnings, reduced uncertainty of future earnings, and stronger links between current earnings and future payoffs to investors, leading to higher IPEQ. In contrast, dividend-decreasing firms tend to be investing in new projects with relatively uncertain future cash flows; consequently, the link between current earnings and future

cash flows is more tenuous, leading to lower IPEQ. To our knowledge, ours is the first study to use e-loading to examine IPEQ in the setting of ICOFR disclosures.¹²

The basis of e-loading is firms' accrual quality, which Dechow and Dichev (2002) measure as the precision with which current accruals map into past-, current-, and future-period cash flows. A key role of accruals is to shift or adjust the representation of cash flows over time so that accounting earnings better measure firm performance than cash flows do. Accruals, however, are imprecise since they are based on assumptions and estimates concerning the amounts, timing, and uncertainty of unrealized future cash flows. Dechow and Dichev argue that the quality of accruals and earnings is negatively associated with the magnitude of estimation errors in accruals. They develop an empirical measure of accrual quality as the standard deviation of the residuals from firm-specific regressions of changes in working capital on past, present, and future cash flows from operations. Francis, LaFond, Olsson, & Schipper (2004) find that among seven investigated earnings attributes, accrual quality is "the dominant attribute in terms of cost of equity effects" (p. 1006). They propose that accrual quality has the most direct link of any accounting measure to information risk as it captures variation in pay-off structures that investors are interested in.

To construct the e-loading measure, Ecker et al. (2006) begin by measuring accrual quality using the modified Dechow-Dichev (2002) model:

$$TCA_{j,T} = \alpha_{0,j} + \alpha_{1,j}CFO_{j,T-1} + \alpha_{2,j}CFO_{j,T} + \alpha_{3,j}CFO_{j,T+1} + \alpha_{4,j}\Delta REV_{j,T} + \alpha_{5,j}PPE_{j,T} + v_{j,T} \quad (1)$$

In equation (1), $TCA_{j,T}$ is firm j 's total current accruals in year T ; $CFO_{j,T-1}$ ($CFO_{j,T}$, $CFO_{j,T+1}$) is firm j 's cash flow from operations in year $T-1$ (T , $T+1$); $\Delta REV_{j,T}$ is firm j 's change in revenues between year $T-1$ and year T ; and $PPE_{j,T}$ is firm j 's gross value of property, plant, and equipment in year T . All variables are scaled by average assets.

Ecker et al. estimate equation (1) in annual industry cross-sections for each of the 48 Fama and French (1997) industries that contain at least 20 firms in an industry-year. These estimations produce firm-year residuals $\hat{\nu}_{j,T}$. The accounting-based earnings quality metric for firm j in year T is the standard deviation of firm j 's residuals over the past five years, $AQ_{j,T} = \sigma(\hat{\nu}_{j,T})$, $T = T-5, \dots, T-1$. Larger (smaller) values of $AQ_{j,T}$ correspond to lower (higher) accrual quality.

Next, Ecker et al. construct an accrual-quality factor-mimicking portfolio. They assign firms to AQ deciles on the first day of each month m based on the firm's most recent value of AQ calculated prior to m . Firms with the smallest (largest) AQ values are placed in the first (tenth) decile. That is, the first decile comprises firms with the best accrual quality; the tenth decile comprises firms with the worst accrual quality. They then calculate the average daily return for each decile. The AQ factor-mimicking portfolio, $AQfactor$, has returns equal to the difference between the daily returns of the poorest AQ deciles (deciles 7 to 10) and the best AQ deciles (deciles 1 to 4). This procedure generates a series of daily $AQfactor$ returns. Finally, they obtain a firm-year-specific returns-based measure of earnings quality by adding $AQfactor$ to the traditional one-factor and Fama-French three-factor asset-pricing models as shown below:

$$R_{j,t} - R_{F,t} = \alpha_{j,T} + \beta_{j,T}(R_{M,t} - R_{F,t}) + e_{j,T}AQfactor_t + \varepsilon_{j,t} \quad (2)$$

$$R_{j,t} - R_{F,t} = \alpha_{j,T} + \beta_{j,T}(R_{M,t} - R_{F,t}) + s_{j,T}SMB_t + h_{j,T}HML_t + e_{j,T}AQfactor_t + \varepsilon_{j,t} \quad (3)$$

In equations (2) and (3) t is an index denoting the trading day in year T ; $R_{j,t}$ is firm j 's return on day t ; $R_{F,t}$ is the risk-free rate of return on day t ; $R_{M,t}$ is the market return on day t ; SMB_t is the return of a small-minus-big size factor portfolio on day t ; and HML_t is the return of the high-minus-low book-to-market factor portfolio on day t . The slope coefficient of $AQfactor$, $e_{j,T}$ represents firm j 's exposure or sensitivity to information risk related to poor earnings quality in

year T . Thus $e_{j,T}$ captures the market's perception of firm j 's earnings quality in year T . Ecker et al. refer to $e_{j,T}$ as e-loading. We use e-loading to investigate associations between IPEQ and ICOFR disclosures.

4.2.2 Controversy over whether accrual quality is a priced risk factor

Our use of e-loading as an IPEQ proxy is immune from controversy in the literature over whether accrual quality is a priced risk factor because, to the extent that IPEQ is positively associated with investor confidence and participation in capital markets, regulators are interested in increasing IPEQ even if it is unassociated with firms' costs of capital. Nonetheless, we briefly outline the nature of the controversy.

Core, Guay, & Verdi (2008) say that Francis, LaFond, Olsson, & Schipper's (2005) regressions examining contemporaneous relations between firms' excess stock returns and factor returns do not test the hypothesis that accrual quality is a priced risk factor. Ecker et al. (2006) use the similar regressions to derive e-loading. It is debatable whether accruals quality is a priced risk factor.¹³ However, Ecker et al. (2006) document e-loading increases in three settings that are likely to exhibit IPEQ declines: earnings restatements, the instigation of lawsuits against firms, and bankruptcy filings. Since ICOFR weakness is similar to those three situations in terms of its likely association with IPEQ, e-loading is an appropriate empirical measure for the purposes of our study.

4.2.3 H1 and H2 univariate tests

H1 tests compare e-loadings of ICMW firms with those of non-ICD firms that do not report *any* internal control problems, whether they be material weaknesses, significant deficiencies, or control deficiencies. Consistent with Doyle et al. (2007b, p. 1147), the stringent

condition for non-ICD firms enhances statistical power by comparing IPEQ of firms reporting the most serious type of ICOFR weaknesses with IPEQ of firms without apparent weaknesses of any type.

The non-ICD sample consists of firms matched with ICMW firms on year, industry, and size to control for confounding factors that are likely to affect IPEQ. To construct the non-ICD sample we first glean from Audit Analytics a list of ICD firms reporting any type of internal control problems during 2002 to 2006.¹⁴ We obtain matching candidates by deleting the ICD firms and Doyle et al.'s 1,210 ICMW firms from all the firms with the required Compustat and CRSP data in each year, 2002-2005. Many firms in the Audit Analytics ICD-list and the Doyle et al. ICMW-list are duplicates, as expected. Matching firms must have valid industry codes and total assets in Compustat and have 250 or more daily stock returns in one year in CRSP.¹⁵

Of the 709 sample firms, 11 disclose ICMW in 2002, 61 in 2003, 194 in 2004, and 443 in 2005. So, we select 11, 61, 194, and 443 matching sample firms from the candidate pool of the corresponding year, using four-digit Standard Industrial Classification (SIC) codes, then three-digit SIC codes, and finally two-digit SIC codes if the more stringent criterion does not identify a match.¹⁶ Among firms in the same year-industry group, we select a matching firm as the one closest in size to the event firm, as measured by the natural logarithm of total assets (Compustat data item #6). We collect market return data for the event sample and the matched sample. We then estimate the firm- and year-specific one-factor and three-factor models (2) and (3) for each of the ICMW firms and matched non-ICD firms during (0, +270).

Appendix 1 illustrates the event-time periods for testing the four hypotheses. For H1 and H2, the three-quarter period after the first disclosure of weaknesses is termed the “Bad Period.” Although it would be desirable to use a full year of daily market return data to reliably estimate firms' e-loading, we choose a three-quarter period because Section 404 requires annual audits of

companies' internal control. If they are successful in remediating ICOFR weaknesses, ICMW firms are likely to receive an unqualified SOX 404 audit report approximately one year after disclosing them, confounding the measurement of IPEQ in the Bad Period. To avoid these confounding effects, we choose three quarters instead of one year as the estimation period. For the same reason, we delete 61 companies receiving their first unqualified SOX 404 audit report during the three-quarter testing period (0, +270).

The test periods for matched non-ICD firms are the same calendar periods as those for ICMW firms. For example, if firm j discloses material weaknesses on February 1, 2005 and the test period (0, +270) is February 1, 2005 to October 29, 2005, we use the same dates for firm j 's matched counterpart. This research design controls for events affecting all firms in a given period. Similar to Ecker et al. (2006, p. 757) who require firms to have at least 100 daily returns in year T to estimate annual e-loading, we require each firm to have at least 100 daily returns in the three-quarter testing period.

The one-factor model (2) generates *AQfactor* regression coefficients (i.e., *Eload-1f*) for the 709 ICMW firms and 709 matched non-ICD firms. Similarly, the three-factor model (3) generates 709 e-loadings (i.e., *Eload-3f*) for both samples. Comparing the mean and median values of e-loadings in the weakness sample and the matched sample provides preliminary evidence of whether IPEQ is lower for ICMW firms than non-ICD firms. For both models the testable hypothesis for H1 is $e_{ICMW} - e_{non-ICD} > 0$.

Using the codes provided by Doyle et al. (2007b), we divide the sample used to test H1 into two subsamples: one with severe company-level material weaknesses (CLMW) and the other with account-specific material weaknesses (ASMW).¹⁷ We test H2 A (B) by comparing e-loadings of CLMW (ASMW) firms with those of the matched firms. For both models the testable hypothesis for H2A is $e_{CLMW} - e_{non-ICD} > 0$; that for H2B is $e_{ASMW} - e_{non-ICD} = 0$.

4.2.4 H1 and H2 multivariate regression tests

Prior literature indicates that, compared with firms not disclosing ICOFR deficiencies, firms disclosing ICOFR deficiencies tend to be smaller, younger, financially weaker, more complex, growing more rapidly, and more likely undergoing restructuring. These firm characteristics are likely to be also associated with IPEQ; moreover, our matching process based on year, industry, and firm size is unlikely to provide a complete control for firm characteristics. Thus, in our second tests of H1 and H2, we conduct multivariate regression analyses to control for firm characteristics that are likely to be associated with firms' ICOFR weaknesses. In the regression models, the dependent variable is IPEQ, measured by *Eload-1f* or *Eload-3f*; the explanatory variable is an indicator variable equal to one if a firm is an ICMW (CLMW, or ASMW) firm and zero if it is a matched non-ICD firm. The control variables include measures for each of the firm characteristics associated with internal control weaknesses: *firm size*, *firm age*, *loss proportion*, *firm segments*, *sales growth*, and *restructuring*.

Dechow and Dichev (2002) identify innate firm characteristics that are likely to determine accrual quality, including firm size, financial health, sales volatility, cash flow volatility, and operating cycle. As accrual quality is the basis for estimating e-loading, those innate characteristics are likely to be related to IPEQ. So, we include the control variables *sales volatility*, *cash flow volatility*, and *operating cycle* in addition to the control variables discussed above. The resulting regression model is:

$$\begin{aligned}
 IPEQ \text{ (Eload-1f or Eload-3f)} = & \beta_0 + \beta_1 \text{ Material Weakness (ICMW, CLMW, or ASMW)} \\
 & + \beta_2 \text{ Firm Size} + \beta_3 \text{ Firm Age} + \beta_4 \text{ Loss Proportion} \\
 & + \beta_5 \text{ Firm Segments} + \beta_6 \text{ Sales Growth} + \beta_7 \text{ Restructuring} \\
 & + \beta_8 \text{ Sales Volatility} + \beta_9 \text{ Cash Flow Volatility} \\
 & + \beta_{10} \text{ Operating Cycle} + \varepsilon
 \end{aligned} \tag{4}$$

Appendix 2 describes the variables. For H1, the testable hypothesis is $\beta_1 > 0$ since a higher value of *Eload-1f* or *Eload-3f* indicates lower IPEQ. For H2A, the testable hypothesis is $\beta_1 > 0$; for H2B the testable hypothesis is $\beta_1 = 0$.

4.2.5 H3 and H4 tests

We test H3 by analyzing changes in e-loading over $(-270, 0, +270)$, i.e., three quarters before and after material weakness disclosures, as shown in Appendix 1. The three pre-disclosure quarters are termed the “Base Period.” Firms disclosing significant deficiencies and control deficiencies during the Base Period are excluded from the H3 sample since unfavorable ICOFR disclosures are likely to taint the measurement of IPEQ. As in the H1 and H2 research design, the three quarters after the first disclosure of material weaknesses are termed the “Bad Period.” Each firm must have at least 100 daily returns in both Base and Bad Periods. We test for e-loading increases (IPEQ declines) in the Bad Period relative to the Base Period using the following regression models (5) and (6):

One-factor model:

$$R_{j,t} - R_{F,t} = \alpha_0 + \alpha_1 D_{j,t} + \beta_0 (R_{M,t} - R_{F,t}) + \beta_1 (R_{M,t} - R_{F,t}) \times D_{j,t} + e_0 AQfactor_t + e_1 AQfactor_t \times D_{j,t} + \varepsilon_{j,t} \quad (5)$$

Three-factor model:

$$R_{j,t} - R_{F,t} = \alpha_0 + \alpha_1 D_{j,t} + \beta_0 (R_{M,t} - R_{F,t}) + \beta_1 (R_{M,t} - R_{F,t}) \times D_{j,t} + s_0 SMB_t + s_1 SMB_t \times D_{j,t} + h_0 HML_t + h_1 HML_t \times D_{j,t} + e_0 AQfactor_t + e_1 AQfactor_t \times D_{j,t} + \varepsilon_{j,t} \quad (6)$$

In models (5) and (6), the indicator variable $D_{j,t}$ is equal to 1 for firm-trading-days on or after ICMW disclosures and 0 before. Thus the coefficient e_1 captures IPEQ changes associated with material weakness disclosures. The testable null H3 is $e_1 = 0$ for both models.

The research design for testing H4 is similar. The indicator variable $D_{j,t}$ is equal to 1 for firm trading days on or after remediation disclosures and 0 before. As shown in Appendix 1, the

test period covers two three-quarter periods: (1) the “Bad Period” ($-270, -1$) after firms first disclose material weaknesses but before they later receive their first clean opinions; and (2) the “Good Period” ($0, +270$) after remediation disclosures. Again each firm must have at least 100 daily returns in both the Bad and Good Periods; firms disclosing ICMW under SOX 302 during the Good Period are excluded since such disclosures are likely to taint the measurement of IPEQ for the period. In models (5) and (6), the coefficient e_1 captures changes in IPEQ associated with firms making audited remediation disclosures. For both models the testable hypothesis is $e_1 < 0$.

[Insert Table 3]

5. Results

5.1 Descriptive statistics

Table 3 gives descriptive statistics for the material-weakness firms and the year-industry-size matched non-ICD firms used in multivariate regression tests of H1 and H2. Panel A compares the characteristics of 642 internal control material weakness (ICMW) firms and matched firms; Panel B compares the subsample of 226 company-level material weakness (CLMW) firms with matched firms; Panel C compares 415 account-specific material weakness (ASMW) firms with matched firms. For each variable, we report the results of differences-in-means tests (two-tailed t-tests) and differences-in-medians tests (two-tailed Wilcoxon tests).

As expected Panel A shows that the ICMW and matched samples are very similar in size. Both have mean total assets of about \$2.2 billion; neither the t- nor the Wilcoxon test indicates any significant difference in mean or median firm size. Similar results apply to age, volatility of cash from operations, and length of the operating cycle; however, firms in the weakness sample exhibit poorer financial condition measured by the proportion of the most recent three years in

which firms report losses. On average, weakness firms report losses in 46% whereas matched firms report losses in only 32% of the years. In terms of the median loss proportion, at least half of the weakness firms suffer a loss in one or more of the most recent three years (as the median of 0.33 implies) whereas at least half of the matched firms do not report such losses. The p-values of less than 0.001 associated with the t- and Wilcoxon tests imply that these differences are statistically significant. Compared to firms in the matched sample, weakness firms incur significantly higher restructuring charges in the most recent two years, have higher sales volatility, and exhibit more complex organizational structures measured by the number of firm segments. Weakness firms also exhibit lower median sales growth rates (0.09) than matched firms (0.12) over the past three years. This finding differs from some findings in prior literature, likely because we use a matched control sample whereas prior studies use universal control samples.

Panel B statistics display patterns very similar to those in Panel A: the CLMW firms are close to their matched counterparts in size, age, operating cash flow volatility, and the length of operating cycle; the two groups differ in their financial health, organizational complexity (marginally different), restructuring, and sales volatility; weakness firms have a higher mean sales growth rate in the most recent three years than the matched firms. In Panel C, besides exhibiting firm characteristics very similar to those in Panel A, the ASMW firms and their matched counterparts are similar in organizational complexity and sales volatility. The descriptive statistics imply that firm matching is likely to control for some but not all firm characteristics that are likely to be related to IPEQ. Thus, the inclusion of control variables for multivariate testing seems appropriate.

[Insert Table 4]

Table 4 presents a correlation matrix of the dependent and independent variables used in regression model (4). The dummy explanatory variable *ICMW* indicating material weakness disclosure is positively correlated with the dependent variables *Eload-1f* and *Eload-3f*, i.e., material weakness firms exhibit higher e-loading (lower IPEQ) than non-ICD firms. *ICMW* is also correlated with some firm characteristics that prior literature finds to be associated with ICOFR deficiencies or with firms' accrual quality: it is positively correlated with the proportion of loss years, the number of firm segments, restructuring charges, and sales volatility. The latter four variables are generally correlated with *Eload-1f* and/or *Eload-3f*, suggesting that firm characteristics as well as *ICMW* are associated with lower IPEQ.

[Insert Table 5]

5.2 Hypothesis testing

5.2.1 H1 and H2 univariate tests

Table 5 presents univariate results of testing H1 and H2. Panel A compares e-loadings of the whole sample of 709 internal control material weakness (ICMW) firms with e-loadings of matched firms. Panel A 1 compares the mean e-loadings of the two groups using a t-test. For ICMW firms the mean of e-loadings from the one-factor (three-factor) model is 0.401 (0.323) and that for the matched firms is 0.283 (0.199). The difference of 0.119¹⁸ (0.124) is significantly greater than zero with a t-statistic of 3.78 (3.58) and a one-tailed p-value less than 0.001 (0.001). Panel A 2 compares the median e-loadings between the same two groups of firms using Wilcoxon tests. The results are similar to the t-test results but median e-loadings are smaller than mean e-loadings. These univariate tests provide preliminary evidence supporting H1: firms

disclosing material weaknesses have lower IPEQ than firms not disclosing any internal control problems.

Panel B compares e-loadings of 250 company-level material weakness (CLMW) firms with those of the matched firms. Results are similar to those in Panel A. Panel B 1 compares mean e-loadings. The mean e-loading for CLMW firms from the one-factor (three-factor) model is 0.513 (0.435) and that for matched firms is 0.323 (0.243). The difference of 0.190 (0.192) is significantly greater than zero with a t-statistic of 3.41 (3.18) and a one-tailed p-value less than 0.001 (0.001). Results are similar in Panel B 2, which compares median e-loadings. These univariate tests provide preliminary evidence supporting H2A: firms disclosing company-level material weaknesses have lower IPEQ than firms not disclosing internal control problems.

Panel C compares the e-loadings of 458 firms disclosing account-specific material weaknesses (ASMW) with those of the matched firms. We report two-tailed p-values because the null hypothesis is that there is no difference in IPEQ for ASMW firms and control firms. Panel C 1 shows that the mean one-factor (three-factor) e-loading of ASMW firms exceeds that of matched firms by 0.079 (0.086). Although the differences are smaller than in Panels A 1 and B 1, the t-statistics and two-tailed p-values indicate that those differences are significantly different from zero. Panel C 2 shows similar results with respect to median e-loadings. The univariate tests thus reject the null hypothesis H2 B. The next section shows that this result vanishes in multivariate tests, however.

[Insert Table 6]

5.2.2 H1 and H2 multivariate regression tests

Table 6 gives the results of multivariate regression tests. We perform six regressions with *Eload-1f* and *Eload-3f* as the two dependent variables in each of the three samples containing

642 ICMW firms, 226 CLMW firms, and 415 ASMW firms with their corresponding matched non-ICD counterparts. We report one-tailed p-values for the estimated coefficients since all explanatory variables except the indicator variable ASMW and the intercept have predicted directional associations with e-loading.

In the first two models used to test H1, *ICMW* is the chief explanatory variable of interest. Consistent with prior literature, *Firm Size* and *Firm Age* are negatively associated with *Eload-1f* and *Eload-3f*, indicating higher e-loading (lower IPEQ) for smaller and younger firms. Also in line with prior studies, *Restructuring*, *Loss Proportion*, and *Operating Cycle* are positively associated with *Eload-1f* and *Eload-3f*, reflecting higher e-loading (lower IPEQ) for firms incurring higher restructuring charges, having higher proportions of loss years, and having operating with longer cycles. The variables *Firm Segments*, *Sales Volatility*, and *Cash Flow Volatility* do not have uniformly significant coefficients but any significant coefficients have the expected signs, indicating lower IPEQ for firms with more complex organizational structures and with higher volatility in sales and operating cash flows. The control variable *Sales Growth* does not exhibit statistically significant coefficients in either model. The coefficient of *ICMW* is 0.05 in both the one- and three-factor models. It has the expected positive sign and is statistically significant but the result is marginal in the three-factor model. Thus H1 is supported, although modestly in the three-factor model: firms disclosing material weaknesses exhibit higher e-loading (lower IPEQ) after controlling for firm characteristics.

The third and fourth models investigate H2 A regarding firms disclosing company-level material weaknesses; *CLMW* is the chief explanatory variable of interest. Results are similar to those in the two preceding models except that some control variables — including *Restructuring*, *Operating Cycle*, and *Cash Flow Volatility* — lose their statistical significance. *Firm Size* and *Firm Age* are still significantly negatively associated with e-loading; *Loss Proportion* is still

significantly positively associated with e-loading. *CLMW* exhibits positive and significant coefficients in both models, supporting H2 A: firms disclosing company-level material weaknesses have lower IPEQ than firms not disclosing any internal control deficiencies. Compared with the coefficients of *ICMW*, those of *CLMW* are larger (0.11 and 0.09 versus 0.05 and 0.05 in the one- and three-factor models, respectively) and have higher significance levels (smaller one-tailed p-values of 0.02 and 0.06 versus 0.04 and 0.09 in the one- and three-factor models, respectively). This comparison indicates that company-level material weaknesses are likely to have a greater negative association with IPEQ than general weaknesses have.

The last two regression models test H2B pertaining to firms disclosing account-specific material weaknesses. The estimated coefficient of *ASMW*, the chief explanatory variable of interest, is 0.02 in both models; two-tailed p-values 0.54 and 0.63 indicate that this is not significantly different from zero. Thus we do not reject the null H2B: there is no significant difference in IPEQ for firms disclosing account-specific material weaknesses and IPEQ for firms not disclosing any internal control deficiencies. This result implies that the rejection of H2B in the univariate analysis in the previous section of the paper can be attributed to differences in firm characteristics. It also suggests that the significant results regarding material weaknesses in general, which were found in the first two regression models, are attributable to disclosures of the more severe company-level weaknesses.

[Insert Table 7]

5.2.3 H3 and H4 tests

Table 7 contains the results of testing within-firm IPEQ changes following ICOFR weakness and remediation disclosures. Panel A gives the results of testing H3 following initial weakness disclosures. The coefficient e_1 from the one-factor (three-factor) model is 0.01 (0.02)

with t-statistic of 0.54 (0.56) and an insignificant two-tailed p-value of 0.59 (0.58). Adjusting for firm-level clusters yields qualitatively the same results. Thus the null H3 is not rejected: firms initially making SOX-mandated ICOFR disclosures of material weaknesses do not exhibit changes in IPEQ, consistent with investors having anticipated firms' ICOFR weaknesses before the SOX-mandated disclosures. Panel B gives the results of testing H4 regarding remediation disclosures using one-tailed p-values since the hypothesis is directional. The coefficient e_1 from the one-factor (three-factor) model is -0.07 (-0.06); this is significantly less than zero with a t-statistic of -2.51 (-1.87) and a one-tailed p-value of 0.01 (0.03). Adjusting for firm-level clusters yields still-significant but slightly weaker results. Overall, H4 is supported: firms' IPEQ increases after they receive their first clean Section 404 opinions subsequent to prior weakness disclosures.

6. Summary and conclusions

We find that US firms disclosing SOX-mandated material weaknesses in internal control over financial reporting (ICOFR) exhibit lower investor-perceived earnings quality (IPEQ) than firms not disclosing internal control deficiencies. After controlling for firm characteristics, however, we find that only company-level material weaknesses, as opposed to account-specific material weaknesses, are likely to be responsible for this association. We do not find any evidence of changes in IPEQ after firms first disclose material weaknesses. This result suggests that, on average, investors anticipate firms' ICOFR deficiencies based on observable firm characteristics and are not surprised by the disclosures. In contrast, firms exhibit IPEQ increases after receiving their first unqualified SOX 404 audit reports signaling the remediation of previously reported ICOFR weaknesses.

The results are germane to public-policy debates about the costs and benefits of SOX-like internal control provisions both in the US and elsewhere. The study provides evidence consistent with the existence of benefits stemming from SOX internal control provisions aimed at enhancing investor confidence in financial reporting reliability. Potential benefits include enhancing investor participation in capital markets and improving capital allocation efficiency. As is often the case in public policy studies, however, empirical evidence consistent with the *existence* of such benefits does not facilitate *quantifying* the benefits in dollar terms and comparing them with the associated costs. Whether hard-to-quantify benefits justify the costs is for regulators to decide.

A key SOX goal is to enhance investor confidence in financial reporting reliability. The finding that company-level material weaknesses are negatively associated with IPEQ lends support to regulators' conviction that sound internal control systems foster investor confidence in firms' financial reporting reliability. Legislative benefits are unlikely to stem from incremental information conveyed by initial weakness disclosures, however. Rather, the disclosures benefit investors by motivating managers to remediate ICOFR weaknesses and providing a venue for firms to make credible, audited remediation disclosures, thereby enhancing investors' perception of the reliability of financial reporting.

The study has several limitations. First, we do not find evidence consistent with the existence of such benefits relating to the disclosure of account-specific material weaknesses. Whether this implies that there are not any benefits or our research design is not powerful enough to detect evidence consistent with such benefits is an issue left for future work. Second, we use e-loading to capture the concept of investor-perceived earnings quality. Ecker et al. (2006) suggest that e-loading is an appropriate measure of IPEQ even though it may not be a priced risk factor; however, to the extent that e-loading does not capture the concept effectively,

our findings should be interpreted with caution. Finally, the material-weakness disclosures examined in this study occurred during August 2002 to October 2005 and the remediation sample comprises large, accelerated SEC filers. Whether the findings can be generalized beyond the sample period and the sample firms is not clear. Future research could examine whether similar results hold for smaller firms when audit data become available for non-accelerated filers in 2010.

Endnotes

¹ AS No. 5 superseded AS No. 2 in 2007. We cite AS No. 2 because it was effective during the period examined.

² An accelerated SEC filer is one meeting four conditions: (i) it has a worldwide market value of at least \$75 million on the last business day of its most recently completed second fiscal quarter; (ii) it is subject to the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934 for a period of at least twelve calendar months; (iii) it has filed at least one annual report pursuant to section 13(a) or 15(d) of the Act; and (iv) it is ineligible to use Forms 10-KSB and 10-QSB for its annual and quarterly reports (Securities Exchange Act of 1934, Rule 12b-2). For non-accelerated filers, Section 404 is effective for fiscal years ending on or after December 15, 2007 for management's assessment report; the auditor's attestation report is not required until fiscal years ending on or after June 15, 2010 (SEC, 2009b).

³ A *significant deficiency* is a control deficiency, or combination of control deficiencies, that adversely affects the company's ability to initiate, authorize, record, process, or report external financial data reliably in accordance with generally accepted accounting principles such that there is more than a remote likelihood that a misstatement of the company's annual or interim financial statements that is more than inconsequential will not be prevented or detected (AS No. 2, paragraph 9). A *control deficiency* exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent or detect misstatements on a timely basis (AS No. 2, paragraph 8).

⁴ Other performance measures include dividends, cash flows, and EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization).

⁵ It is unclear whether the lower market returns stem from spikes in information risk, expected ICOFR remediation costs to be incurred by the firms, or investors' concern about management's ability to control the business.

⁶ See <http://faculty.washington.edu/geweili/ICdata.html> and <http://www.business.utah.edu/display.php?module=facultyDetails&personPageId=3374&personId=1373&orgId=962&fromOrg=962>.

⁷ See http://faculty.fuqua.duke.edu/~fecker/EFKOS_2006.htm. The most recent *AQfactor* data for 2006 were obtained directly from the authors.

⁸ See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

⁹ We use a slightly longer period for the Audit Analytics search to allow for Audit Analytics recording the event after October 2005, the ending point of Doyle et al. (2007b) sample.

¹⁰ Reasons for discrepancies include: 1. Audit Analytics does not include Forms 8K, which are important sources of companies' initial disclosure of material weaknesses. 2. Audit Analytics does not collect a complete set of Forms 10K/A or 10Q/A for some companies. 3. The Audit Analytics data contain coding errors. 4. The Doyle et al. dataset contains some event-date errors due to manual collection; however, event-dates errors have little, if any, negative impact on the results of that study because it uses several years of annual accounting data to investigate firms' accrual quality; hence, the results are not sensitive to within-year event-dates.

¹¹ Errors in the dates of companies' first disclosure of ICOFR weakness under SOX are evidently common. For example, Ashbaugh-Skaife et al. obtain an initial sample of ICOFR deficiency firms from *Compliance Week*. Approximately 39% of their sample firms disclose an internal control problem in an SEC document filed before the one reported in *Compliance Week* (Ashbaugh-Skaife, Collins, & Kinney, 2007, p. 177).

¹² Beneish et al. (2008) use e-loading as a criterion to construct the matched sample. They do not apply e-loading to directly test perceived earnings quality.

¹³ Kim and Qi (2010) show that accrual quality is a market priced risk factor using the same technique of two-stage cross-sectional regression tests that Core et al. (2008) use, after controlling for low-priced stocks.

¹⁴ ICD firms during 2006 are collected to avoid matching an event firm disclosing ICMW in late 2005 with a firm that discloses ICD in early or mid 2006 but not in previous years. As e-loading after disclosure of ICMW is measured using daily stock return data three quarters immediately after the disclosure, a firm with an ICD disclosure in early or mid 2006 does not qualify as a clean firm that can be matched with a firm disclosing ICMW in late 2005.

¹⁵ The number 250 is chosen because we require at least 100 daily return data in three quarters to calculate e-loadings for matched firms and statistics show that in each year of 2002 to 2005, approximately 95% of all the non-ICD firms meeting the Compustat data requirement and covered by the CRSP Daily Stock File have 252 daily stock

returns. We subjectively choose 250 to allow firms that miss only one or two days of return data in one year to qualify as a matching candidate.

¹⁶ Of the 709 sample firms, 693 firms are matched on four-digit SIC codes, 7 firms three-digit SIC codes, and 8 firms two-digit SIC codes. One firm with SIC code 4100 (transit and passenger transportation) does not have a two-digit match. We match it to firms with a two-digit code of 40 (railway service), which is in the same Fama-French-48-industry group as 41.

¹⁷ One sample firm used in H1 is excluded from H2 testing due to lack of the weakness severity code.

¹⁸ The difference between the one-factor mean e-loading of ICMW firms and that of matched firms is 0.119 instead of 0.118 (0.401–0.283) in Panel A due to rounding. Similar situations are marked “ $\$$ ” in Panels B and C.

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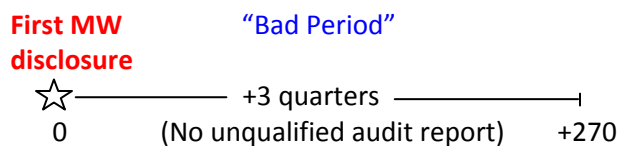
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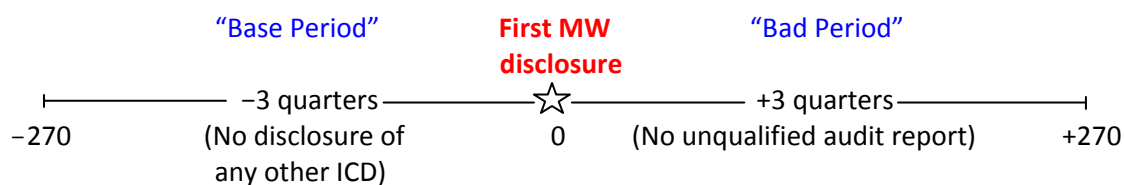
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Appendix 1. Research design

H1 & H2 (cross sections)



H3 (time series)



H4 (time series)



Appendix 2. Variable definitions

Investor-perceived earnings quality (IPEQ)

Eload-1f (Eload-3f) The slope coefficient from a regression of a firm's daily excess returns in year T on a factor-mimicking portfolio capturing earnings quality, controlling for the factor of market risk premium (three factors of market risk premium, size, and book-to-market ratio).

Material weakness disclosure

- *ICMW* An indicator variable that is equal to one if the firm discloses at least one internal control material weakness in the sample period (August 2002 to October 2005), and zero otherwise.
- *CLMW (ASMW)* An indicator variable that is equal to one if the firm discloses a company-level (an account-specific) material weakness in internal control in the sample period, and zero if it makes no disclosure of any type of internal control deficiencies.

Material weakness determinants that could be related to perceived earnings quality

- *Firm Size* The natural logarithm of total assets [Compustat #6] in year t .
- *Firm Age* The natural logarithm of the number of years the firm has Compustat data as of year t .
- *Loss Proportion* The proportion of years during the past three years ($t-2$, $t-1$, and t) that a firm reports negative earnings [Compustat #18].
- *Firm Segments* The natural logarithm of the sum of the number of operating and geographic segments reported by the Compustat Segments database for the firm in year t .
- *Sales Growth* The geometric average growth rate in sales [Compustat #12] from year $t-2$ to t .
- *Restructuring* The aggregate restructuring charges [Compustat #376 \times (-1)] in $t-1$ and t , scaled by the firm's year t market capitalization [Compustat #199 \times #25].

Additional innate firm characteristics that affect accruals quality and could be related to perceived earnings quality

- *Sales Volatility* The standard deviation of sales [Compustat #12], scaled by average assets [Compustat #6], from year $t-6$ to year t , requiring at least three years of data.
- *Cash Flow Volatility* The standard deviation of cash from operations [Compustat #308], scaled by average assets, from year $t-6$ to year t , requiring at least three years of data.
- *Operating Cycle* The natural logarithm of the average of $[360/(\text{sales}/\text{average accounts receivable}) + 360/(\text{cost of goods sold}/\text{average inventory})]$, calculated from year $t-6$ to year t , requiring at least three years of data. [accounts receivable: Compustat #2; cost of goods sold: Compustat #41; inventory: Compustat #3]

Table 1.
Verification of dates of first material weakness disclosures

Panel A. Comparison of dates in Doyle et al. (2007b) vs. Audit Analytics	
Number of sample firms in Doyle et al. (2007b) disclosing material weaknesses for the first time under SOX during August 2002 to October 2005	1,210
Less firms lacking identification information	<u>-242</u>
Remaining firms	<u>968</u>
Comparison of dates for remaining firms in Doyle et al. vs. Audit Analytics:	
Firms not covered by Audit Analytics	129
Firms have the same event dates	382
Firms with different event dates	<u>457</u>
	<u>968</u>

Number of days between disclosure dates for the 457 firms that have different event dates – Audit Analytics event date minus Doyle et al. event date:	
Mean	82
Minimum	-898
10 th percentile	-160
25 th percentile	-10
Median	26
75 th percentile	181
90 th percentile	386
Maximum	1,315

Panel B. Date verification via 10K Wizard	
Number of firms whose event dates are verified via 10K Wizard	968
Less firms with erroneous identification information	-10
Less firms that disclosed material weaknesses before August 1, 2002	-10
Less firms without disclosure of material weaknesses	<u>-4</u>
Total valid firms to form the basis for various hypothesis testing	<u>944</u>

Table 2. Sample selection

Initial number of sample firms for testing the undernoted hypotheses		944
<hr/>		
H1 and H2:		944
Firms receiving unqualified SOX 404 audit opinions during the three-quarter testing period	61	
Firms lacking adequate daily stock return data	147	
Firms lacking Compustat data required to construct the matched sample	<u>27</u>	<u>-235</u>
Firms with data required for H1 and H2 univariate tests [§]		709
Firms lacking Compustat data for control variables		<u>-67</u>
Total sample firms with data required for H1 and H2 multivariate tests [§]		<u>642</u>
<hr/>		
H3:		944
Firms receiving unqualified SOX 404 audit opinions during the three-quarter testing period	61	
Firms disclosing other non-material weaknesses during the three-quarter testing period	120	
Firms lacking adequate daily stock return data	<u>147</u>	<u>-328</u>
Total sample firms with data required to test H3		<u>616</u>
<hr/>		
H4:		944
Firms that did not receive their first unqualified SOX 404 audit reports during year 2004 to 2006 after disclosing material weaknesses	483	
Firms with time lags of less than three quarters between the date of receiving the unqualified audit report and the date of first disclosing weaknesses	57	
Firms disclosing material weaknesses again under SOX 302 during the three quarters after receiving unqualified audit reports	11	
Firms receiving unqualified audit reports after March 31, 2006	77	
Firms lacking adequate daily stock return data	<u>15</u>	<u>-643</u>
Total sample firms with data required to test H4		<u>301</u>

[§] As one sample firm of H1 lacks the Doyle et al. (2007b) code of material weakness type, the number of total sample firms for H2 univariate tests is 708 (250 with company-level weaknesses and 458 with account-specific weaknesses) and for H2 multivariate tests is 641 (226 with company-level weaknesses and 415 with account-specific weaknesses).

Table 3. Descriptive statistics**Panel A. Internal control material weakness (ICMW) firms versus matched (non-ICD) firms**

Variables	Internal control material weakness firms (642)		Matched firms (642)		T-test of mean difference	Wilcoxon test of median difference
	Mean	Median	Mean	Median	P-value	P-value
Firm Size	2,183	273	2,175	294	0.984	0.389
Firm Age	17.673	13.000	16.682	12.000	0.153	0.356
Loss Proportion	0.456	0.333	0.320	0.000	<0.001	<0.001
Firm Segments	4.670	4.000	4.363	4.000	0.049	0.072
Sales Growth	0.186	0.093	0.171	0.119	0.509	0.023
Restructuring	0.015	0.000	0.006	0.000	<0.001	<0.001
Sales Volatility	0.350	0.247	0.301	0.219	0.007	0.067
Cash Flow Volatility	0.087	0.064	0.085	0.065	0.524	0.807
Operating Cycle	197	113	202	108	0.835	0.122

Panel B. Company-level material weakness (CLMW) firms versus matched (non-ICD) firms

Variables	Company-level material weakness firms (226)		Matched firms (226)		T-test of mean difference	Wilcoxon test of median difference
	Mean	Median	Mean	Median	P-value	P-value
Firm Size	1,881	191	1,763	207	0.853	0.730
Firm Age	16.451	13.000	15.518	12.000	0.385	0.493
Loss Proportion	0.532	0.667	0.364	0.333	<0.001	<0.001
Firm Segments	4.575	4.000	4.195	4.000	0.100	0.139
Sales Growth	0.238	0.100	0.158	0.119	0.071	0.889
Restructuring	0.017	0.000	0.006	0.000	0.005	0.047
Sales Volatility	0.377	0.274	0.299	0.227	0.012	0.090
Cash Flow Volatility	0.096	0.069	0.090	0.069	0.370	0.546
Operating Cycle	192.090	126.829	248.380	121.778	0.157	0.612

Table 3. Descriptive statistics (continued)**Panel C. Account-specific material weakness (ASMW) firms versus matched (non-ICD) firms**

Variables	Account-specific material weakness firms (415)		Matched firms (415)		T-test of mean difference	Wilcoxon test of median difference
	Mean	Median	Mean	Median	P-value	P-value
Firm Size	2,353	334	2,404	367	0.924	0.409
Firm Age	18.366	13.000	17.342	13.000	0.254	0.519
Loss Proportion	0.413	0.333	0.294	0.000	<0.001	<0.001
Firm Segments	4.730	4.000	4.463	4.000	0.193	0.246
Sales Growth	0.158	0.090	0.172	0.121	0.564	0.010
Restructuring	0.014	0.000	0.006	0.000	0.002	0.011
Sales Volatility	0.336	0.246	0.303	0.215	0.141	0.295
Cash Flow Volatility	0.081	0.061	0.082	0.063	0.937	0.858
Operating Cycle	200.400	105.433	175.740	100.971	0.382	0.119

All variables are defined in Appendix 2. For ease of interpretation, we present in this table the untransformed values (instead of the natural logarithm) of *Firm Size*, *Firm Age*, *Firm Segments*, and *Operating Cycle*. The t-test results for the logarithms of the values are similar. In this table, the unit of total assets used to measure *Firm Size* is millions of dollars. The t-test of means uses the pooled method when the underlying variances are equal and the Satterthwaite method when the variances are unequal. All p-values are two-tailed. Each of the continuous variables is winsorized at 1% and 99% to mitigate outliers.

Table 4. Pearson/Spearman correlation matrix

	ICMW	Eload-1f	Eload-3f	Firm Size	Firm Age	Loss Proportion	Firm Segments	Sales Growth	Restructuring	Sales Volatility	Cash Flow Volatility	Operating Cycle
ICMW		0.106 ($<.001$)	0.097 ($<.001$)	-0.021 (0.461)	0.029 (0.302)	0.167 ($<.001$)	0.047 (0.092)	0.018 (0.509)	0.118 ($<.001$)	0.075 (0.007)	0.018 (0.524)	0.034 (0.221)
Eload-1f	0.100 ($<.001$)		0.865 ($<.001$)	-0.252 ($<.001$)	-0.222 ($<.001$)	0.389 ($<.001$)	-0.029 (0.297)	0.031 (0.265)	0.162 ($<.001$)	0.069 (0.013)	0.204 ($<.001$)	0.070 (0.012)
Eload-3f	0.102 ($<.001$)	0.852 ($<.001$)		-0.296 ($<.001$)	-0.207 ($<.001$)	0.411 ($<.001$)	-0.015 (0.599)	0.039 (0.165)	0.159 ($<.001$)	0.020 (0.476)	0.181 ($<.001$)	0.081 (0.004)
Firm Size	-0.024 (0.389)	-0.278 ($<.001$)	-0.329 ($<.001$)		0.208 ($<.001$)	-0.347 ($<.001$)	0.243 ($<.001$)	-0.037 (0.180)	0.039 (0.165)	-0.154 ($<.001$)	-0.386 ($<.001$)	0.031 (0.275)
Firm Age	0.026 (0.357)	-0.254 ($<.001$)	-0.248 ($<.001$)	0.190 ($<.001$)		-0.249 ($<.001$)	0.192 ($<.001$)	-0.262 ($<.001$)	-0.006 (0.818)	-0.102 ($<.001$)	-0.262 ($<.001$)	0.000 (0.996)
Loss Proportion	0.174 ($<.001$)	0.385 ($<.001$)	0.418 ($<.001$)	-0.364 ($<.001$)	-0.265 ($<.001$)		-0.012 (0.667)	0.026 (0.350)	0.248 ($<.001$)	-0.050 (0.074)	0.218 ($<.001$)	0.105 ($<.001$)
Firm Segments	0.050 (0.072)	-0.033 (0.231)	-0.023 (0.416)	0.230 ($<.001$)	0.158 ($<.001$)	0.007 (0.810)		-0.084 (0.003)	0.126 ($<.001$)	-0.080 (0.004)	-0.120 ($<.001$)	0.141 ($<.001$)
Sales Growth	-0.063 (0.023)	-0.034 (0.217)	-0.032 (0.252)	0.039 (0.161)	-0.231 ($<.001$)	-0.182 ($<.001$)	-0.065 (0.020)		-0.126 ($<.001$)	0.160 ($<.001$)	0.221 ($<.001$)	0.114 ($<.001$)
Restructuring	0.090 (0.001)	0.068 (0.015)	0.048 (0.088)	0.178 ($<.001$)	-0.007 (0.813)	0.182 ($<.001$)	0.207 ($<.001$)	-0.196 ($<.001$)		0.037 (0.183)	0.006 (0.816)	0.032 (0.251)
Sales Volatility	0.051 (0.067)	0.120 ($<.001$)	0.075 (0.007)	-0.214 ($<.001$)	-0.087 (0.002)	-0.046 (0.098)	-0.047 (0.096)	0.206 ($<.001$)	-0.006 (0.839)		0.267 ($<.001$)	-0.169 ($<.001$)
Cash Flow Volatility	0.007 (0.808)	0.271 ($<.001$)	0.247 ($<.001$)	-0.443 ($<.001$)	-0.287 ($<.001$)	0.215 ($<.001$)	-0.129 ($<.001$)	0.177 ($<.001$)	-0.083 (0.003)	0.434 ($<.001$)		0.115 ($<.001$)
Operating Cycle	0.043 (0.122)	0.096 (0.001)	0.111 ($<.001$)	-0.092 (0.001)	0.013 (0.642)	0.132 ($<.001$)	0.178 ($<.001$)	0.020 (0.485)	0.042 (0.129)	-0.158 ($<.001$)	0.113 ($<.001$)	

All variables are defined in Appendix 2. Pearson correlations are above the diagonal; Spearman correlations below. Each continuous variable is winsorized at 1% and 99% to mitigate the impact of outliers on correlation coefficients. Significant correlation coefficients (two-tailed p-value $\leq 10\%$) are in bold.

Table 5. E-loading comparisons**Panel A. Comparison of e-loadings between internal control material weakness (ICMW) firms and matched firms****Panel A. 1. Comparison of mean e-loadings using the t-test**

Model	Number of firm pairs	ICMW firms	Matched firms	Difference	T-statistic	One-tailed p-value
One-factor	709	0.401	0.283	0.119 [§]	3.78	<0.001
Three-factor		0.323	0.199	0.124	3.58	<0.001

Panel A. 2. Comparison of median e-loadings using the Wilcoxon test

Model	Number of firm pairs	ICMW firms	Matched firms	Difference	Z-statistic	One-tailed p-value
One-factor	709	0.275	0.176	0.099	3.52	<0.001
Three-factor		0.190	0.089	0.101	3.64	<0.001

Panel B. Comparison of e-loadings between company-level material weakness (CLMW) firms and matched firms**Panel B. 1. Comparison of mean e-loadings using the t-test**

Model	Number of firm pairs	CLMW firms	Matched firms	Difference	T-statistic	One-tailed p-value
One-factor	250	0.513	0.323	0.190	3.41	<0.001
Three-factor		0.435	0.243	0.192	3.18	<0.001

Panel B. 2. Comparison of median e-loadings using the Wilcoxon test

Model	Number of firm pairs	CLMW firms	Matched firms	Difference	Z-statistic	One-tailed p-value
One-factor	250	0.413	0.240	0.173	3.32	<0.001
Three-factor		0.367	0.114	0.252 [§]	3.19	0.001

Table 5. E-loading comparisons (continued)**Panel C. Comparison of e-loadings between account-specific material weakness (ASMW) firms and matched firms****Panel C. 1. Comparison of mean e-loadings using the t-test**

Model	Number of firm pairs	ASMW firms	Matched firms	Difference	T-statistic	Two-tailed p-value
One-factor	458	0.339	0.260	0.079	2.10	0.04
Three-factor		0.262	0.175	0.086 [§]	2.06	0.04

Panel C. 2. Comparison of median e-loadings using the Wilcoxon test

Model	Number of firm pairs	ASMW firms	Matched firms	Difference	Z-statistic	Two-tailed p-value
One-factor	458	0.222	0.157	0.065	1.92	0.06
Three-factor		0.129	0.074	0.054 [§]	2.16	0.03

[§] In Panel A, the difference between the one-factor mean e-loading of ICMW firms and that of matched firms is 0.119 instead of 0.118 (0.401–0.283) due to rounding. Similar situations are marked in Panels B and C.

E-loading is the estimated coefficient of $AQfactor$, i.e., $e_{j,T}$, for each weakness firm (or each matched non-internal control deficiency firm) during the test period covering three quarters after disclosure of material weaknesses, i.e., (0, +270), from the following one-factor and three-factor regression models:

$$R_{j,t} - R_{F,t} = \alpha_{j,T} + \beta_{j,T}(R_{M,t} - R_{F,t}) + e_{j,T}AQfactor_t + \varepsilon_{j,t}$$

$$R_{j,t} - R_{F,t} = \alpha_{j,T} + \beta_{j,T}(R_{M,t} - R_{F,t}) + s_{j,T}SMB_t + h_{j,T}HML_t + e_{j,T}AQfactor_t + \varepsilon_{j,t}$$

where t = index for the trading day in the testing period; j = index for firm j ; $R_{j,t}$ = firm j 's return on day t ; $R_{F,t}$ = the risk-free rate of return on day t ; $R_{M,t}$ = the market return on day t ; SMB_t = return of the small-minus-big factor-mimicking portfolio on day t ; HML_t = return of the high-minus-low book-to-market factor-mimicking portfolio on day t ; $AQfactor_t$ = return of the poor-minus-good accruals quality factor-mimicking portfolio on day t .

Table 6. Multivariate regression analysis

Dependent variables:		Eload-1f	Eload-3f	Eload-1f	Eload-3f	Eload-1f	Eload-3f
Independent variables	Predicted signs of independent variables	Coefficient estimate (one-tailed p-value [§])					
Intercept		0.46 (<0.001)	0.50 (<0.001)	0.66 (0.004)	0.71 (0.003)	0.40 (0.005)	0.45 (0.004)
ICMW (Internal control material weakness)	+	0.05 (0.04)	0.05 (0.09)				
CLMW (Company-level material weakness)	+			0.11 (0.02)	0.09 (0.06)		
ASMW (Account-specific material weakness)	?					0.02 (0.54)	0.02 (0.63)
Firm Size	-	-0.04 (<0.001)	-0.07 (<0.001)	-0.05 (0.004)	-0.08 (0.002)	-0.03 (0.005)	-0.06 (0.002)
Firm Age	-	-0.11 (<0.001)	-0.10 (<0.001)	-0.16 (0.001)	-0.14 (0.002)	-0.09 (0.001)	-0.09 (0.005)
Firm Segments	+	0.01 (0.30)	0.04 (0.09)	0.02 (0.32)	0.02 (0.31)	0.00 (0.48)	0.03 (0.14)
Restructuring	+	1.33 (0.001)	1.48 (0.001)	0.54 (0.22)	0.78 (0.15)	1.90 (<0.001)	1.99 (0.001)
Loss Proportion	+	0.41 (<0.001)	0.47 (<0.001)	0.40 (0.002)	0.52 (0.002)	0.41 (0.001)	0.43 (0.002)
Sales Growth	+	-0.04 (0.17)	0.00 (0.46)	-0.05 (0.20)	0.02 (0.38)	-0.03 (0.28)	-0.01 (0.43)
Sales Volatility	+	0.08 (0.05)	-0.01 (0.42)	0.22 (0.01)	0.04 (0.35)	0.00 (0.48)	-0.04 (0.26)
Cash Flow Volatility	+	0.49 (0.02)	0.19 (0.23)	0.32 (0.22)	0.00 (0.50)	0.52 (0.04)	0.24 (0.24)
Operating Cycle	+	0.03 (0.06)	0.03 (0.05)	0.02 (0.27)	0.02 (0.25)	0.03 (0.06)	0.03 (0.06)
Number of weakness firms		642	642	226	226	415	415
Number of total observations		1,284	1,284	452	452	830	830
Adjusted R ²		19.13%	20.99%	18.78%	23.08%	18.45%	18.67%

[§] One-tailed p-values are reported for the estimated coefficients that have a predicted sign. Two-tailed p-values are reported for the intercept and the variable *ASMW*. All variables are defined in Appendix 2. Each of the continuous variables is winsorized at 1% and 99% to mitigate the impact of outliers.

Table 7. Within-firm changes in e-loading**Panel A. After disclosure of internal control material weaknesses**

Model	Number of firms	Coefficient e_1	T-statistic	Two-tailed p-value	Adjusted for firm clusters	
					T-statistic	Two-tailed p-value
One-factor	616	0.01	0.54	0.59	0.39	0.70
Three-factor		0.02	0.56	0.58	0.38	0.70

Panel B. After disclosure of remediation of internal control material weaknesses

Model	Number of firms	Coefficient e_1	T-statistic	One-tailed p-value	Adjusted for firm clusters	
					T-statistic	One-tailed p-value
One-factor	301	-0.07	-2.51	0.01	-1.94	0.03
Three-factor		-0.06	-1.87	0.03	-1.70	0.05

The coefficient e_1 is estimated during the three quarters prior to and after the internal control disclosure, i.e., (-270, 0, +270), from the following one-factor and three-factor regression models:

One-factor model:

$$R_{j,t} - R_{F,t} = \alpha_0 + \alpha_1 D_{j,t} + \beta_0 (R_{M,t} - R_{F,t}) + \beta_1 (R_{M,t} - R_{F,t}) \times D_{j,t} + e_0 AQfactor_t + e_1 AQfactor_t \times D_{j,t} + \varepsilon_{j,t}$$

Three-factor model:

$$R_{j,t} - R_{F,t} = \alpha_0 + \alpha_1 D_{j,t} + \beta_0 (R_{M,t} - R_{F,t}) + \beta_1 (R_{M,t} - R_{F,t}) \times D_{j,t} + s_0 SMB_t + s_1 SMB_t \times D_{j,t} + h_0 HML_t + h_1 HML_t \times D_{j,t} + e_0 AQfactor_t + e_1 AQfactor_t \times D_{j,t} + \varepsilon_{j,t}$$

where t = index for the trading day in the testing period; j = index for firm j ; $D_{j,t}$ = a dummy variable indicating whether a trading day is after (including equal to) the day of disclosure ($D=1$) or before the day of disclosure ($D=0$); $R_{j,t}$ = firm j 's return on day t ; $R_{F,t}$ = the risk-free rate of return on day t ; $R_{M,t}$ = the market return on day t ; SMB_t = return of the small-minus-big factor-mimicking portfolio on day t ; HML_t = return of the high-minus-low book-to-market factor-mimicking portfolio on day t ; $AQfactor_t$ = return of the poor-minus-good accruals quality factor-mimicking portfolio on day t .