

**THE INFORMATION CONTENT OF INTERNAL CONTROLS LEGISLATION:  
EVIDENCE FROM MATERIAL WEAKNESS DISCLOSURES**

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## **ABSTRACT**

JAMES H. IRVING, II: The Information Content of Internal Controls Legislation: Evidence from Material Weakness Disclosures  
(Under the direction of Wayne Landsman)

This paper examines the information content of internal controls legislation, as mandated by Sections 302 and 404 of the Sarbanes-Oxley Act of 2002. I draw on two conventional measures of information content – stock return volatility and trading volume – and find that these two measures exhibit a statistically larger event period reaction to firms’ initial material weakness disclosures relative to an adjacent non-event period and to a matched sample of control firms. In the multivariate setting, I find a significant, positive relation between the material weakness variable and both information content measures after controlling for multiple other sources of event period news. In an additional test of informativeness, I find support for the hypothesis that Section 404 disclosures are incrementally informative to the initial Section 302 disclosures. Collectively, the evidence suggests that investors respond to the information contained in material weakness disclosures, consistent with these disclosures providing an additional piece of value-relevant news for investors to consider in making resource allocation decisions.

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## **CHAPTER 1**

### **INTRODUCTION**

This paper examines whether public disclosure of internal control information affects the trading behavior of equity investors. Specifically, I investigate whether material weakness disclosures are associated with contemporaneous stock price changes and/or increased trading volume. Internal controls over financial reporting are the set of routine policies and procedures governing the financial transactions of a firm, as established and enforced by management. Examples range from segregating the duties of employees to developing a consistent methodology for estimating the value of an asset or liability. An effective system of internal controls protects the integrity of transactions recorded as inputs to the financial reporting system and aggregated into financial reports. If large and/or systematic deficiencies are embedded within a firm's system of internal controls, past, present, and future financial data upon which capital market participants base their decisions may be distorted.

Despite the seemingly fundamental significance of internal controls to consumers of financial reports, public disclosure about a firm's system of internal controls was very limited before the Sarbanes-Oxley Act of 2002 (SOX Act). In particular, pre-SOX Act SEC regulations required a firm to report on internal control issues only when making a change in

its independent auditor (SEC, 1988).<sup>1</sup> Sections 302 and 404 of the SOX Act prompted an exogenous change in internal control reporting, from a regime of virtually no disclosure or legal liability risk to a regime of mandated disclosure at fixed intervals with considerable legal penalties.<sup>2</sup> Subsequent to the August 29, 2002 SOX Act inception date, all public registrants began periodically evaluating and reporting on the effectiveness of their internal controls systems.

A key policy question surrounding the internal controls legislation asks whether mandated Section 302 and 404 disclosures have been effective in accomplishing the main objective of the SOX Act – “[T]o protect investors by improving the accuracy and reliability of corporate disclosures.” On the one hand, proponents characterize the costs associated with Sections 302 and 404 as an investment with long-term benefits and a step in the right direction for corporate reform. Samuel DiPiazza, CEO of the public accounting firm PricewaterhouseCoopers (PwC), summarizes this view: “We are finding that the focus on internal controls is uncovering problems at the best of companies.”<sup>3</sup>

On the other hand, chief executives and corporate lobbying associations have criticized the imbalance and inflexibility of the new internal control disclosure rules. In voicing their disapproval, they argue that benefits of the legislation are hard to spot, while the costs are much larger than expected and consist of not only cash resources but also productivity losses.

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<sup>1</sup> In a study of mandatory internal control disclosures, Whisenant et al. (2003) finds that, for a sample of 1,264 auditor changes spanning the 4-year period 1993-1996, internal control-related reportable events surface in only 83 (6.6%) of the filings. Prior work with respect to voluntary internal control disclosures (Raghunandan and Rama, 1994 and McMullen et al., 1996) finds that firms’ discretionary disclosures are limited and tend to focus on the existence rather than the effectiveness of their internal control systems.

<sup>2</sup> Section 906 of the SOX Act establishes monetary penalties of up to \$5 million and/or imprisonment of up to 20 years for certifying executives who knowingly withhold information from their financial reports.

<sup>3</sup> “No Escaping Sarbanes-Oxley.” Business Week Online Edition, January 6, 2005.

Additionally, these critics are puzzled as to why the internal control disclosure rules are applied uniformly to public registrants that differ considerably on dimensions such as industry, size, and complexity. Even SEC Commissioner Paul Atkins has weighed in on the topic, stating, “Perhaps nothing in recent memory has more starkly illustrated the need to perform honest and probing cost/benefit analyses before requirements take effect than the regulatory regime that has grown under Section 404 of the Sarbanes-Oxley Act.”<sup>4</sup>

A thorough assessment of the effectiveness of the SOX Act’s internal control disclosure provisions would require, at a minimum, an operational definition of effectiveness, a viable cost-benefit model, an evaluation from the perspective of each capital market stakeholder group, and an extended time series of data. Consequently, this paper considers a *necessary condition* for determining the effectiveness of the internal control disclosure provisions – *informativeness* – by examining the information content of material weakness disclosures.<sup>5</sup> In an effort to build on prior and concurrent research studying the effect of internal control disclosures on firms’ stock returns, I adopt a different methodology and employ two conventional measures of information content: unexpected return volatility (*URV*) and unexpected trading volume (*UTV*).

I find that investors react significantly to the information contained in firms’ initial material weakness disclosures. Specifically, I collect a sample of 565 unique firms disclosing initial material weaknesses for the period extending from the SOX Act inception date through the end of the inaugural Section 404 reporting period. A univariate analysis

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<sup>4</sup> Remarks before the National Association of State Treasuries, Incline Village, Nevada, September 20, 2005.

<sup>5</sup> Material weaknesses, the most severe type of internal control issues, are the focal point of this study. The SOX Act requires disclosure of material weaknesses under both Sections 302 and 404. Internal control issues below the material weakness threshold (significant deficiencies and control deficiencies) are not mandatory disclosures.

compares this treatment sample of material weakness firms in a short-window event period with: (i) the treatment sample in an adjacent non-event period; and (ii) a control sample of non-internal control issue firms within the event period. I find that the treatment sample *URV (UTV)* mean in the event period is 1.9 times (2.1 times) larger than the *URV (UTV)* treatment sample mean in the non-event period. Similarly, I find that, within the event period, the treatment sample *URV (UTV)* mean is 2.0 times (1.8 times) larger than the *URV (UTV)* mean of the corresponding control sample. Statistical tests of differences in sample means confirm that the treatment sample is measurably larger than both the non-event period and the control sample.<sup>6</sup>

In cross-sectional regression models that control for event period news, I find a significant, positive relation between the primary material weakness variable and both information content measures. The evidence from this multivariate analysis supports the univariate findings and is robust to a number of sensitivity checks. In a supplemental test, I find support for the hypothesis that there is information in firms' Section 404 disclosures incremental to their initial Section 302 material weakness disclosures. Collectively, the evidence suggests that investors respond to the information contained in material weakness disclosures, consistent with the internal control disclosure provisions of the SOX Act providing an additional piece of value-relevant news for investors to consider in making resource allocation decisions.

The paper proceeds as follows: Section 2 provides an institutional overview. Section 3 reviews the extant literature and Section 4 develops the hypotheses. Section 5 introduces the

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<sup>6</sup> Differences in event period medians for the treatment sample across both information content measures are also statistically larger relative to both the non-event period median and the control sample median. I report both mean and median results in Section 6.

research design. Section 6 details the sample selection process and describes the data. Section 7 presents the empirical results and Section 8 concludes.

## CHAPTER 2

### INSTITUTIONAL OVERVIEW

Prior to the late twentieth century, there was no formal benchmark for evaluating the effectiveness of internal controls. Likewise, prior to the early twenty-first century, there was practically no public disclosure on internal controls. The following sections review the evolution of assessing and reporting on internal controls.

#### 2.1 The evolution of internal control policy

The Foreign Corrupt Practices Act of 1977 (FCPA) was the first formal attempt at legislating internal control policy. A primary element of this legislation required SEC registrants to develop and sustain an adequate system of internal controls. In 1992, the Committee of Sponsoring Organizations of the Treadway Commission (COSO) developed a “model” of internal controls. The resulting publication, *Internal Control – Integrated Framework*, identified the components central to an effective system of internal controls, providing a benchmark by which firms could more rigorously evaluate their internal control systems. The Public Company Accounting Oversight Board (PCAOB) issued Auditing Standard No. 2 (AS2) in 2004 as a blueprint for management and its independent auditor to use in assessing internal controls effectiveness.<sup>7</sup> AS2 more concretely delineated the levels

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<sup>7</sup> The PCAOB is a non-profit organization created by Title I of the SOX Act whose primary responsibility is to oversee the independent auditing profession.

of internal control issues and endorsed the COSO framework as “a suitable and available framework for purposes of management’s assessment.” (AS2, ¶14).

## 2.2 Internal control provisions of the SOX Act

Sections 302 and 404 of the SOX Act made use of the “technology” developed by FCPA, COSO, and the PCAOB to put the new internal control disclosure regime into action. In addition to thoroughly documenting and testing internal controls, SEC registrants were now obligated to publicly report their findings. In particular, Section 302 requires a firm’s top executives to certify the accuracy of corporate financial reports in each quarterly and annual SEC filing. A central part of this section entails disclosing whether there are significant changes in internal controls or in other factors that could significantly affect internal controls (Section 302(a)(6)). Firms began making disclosures in accordance with the Section 302 guidance in the first fiscal period subsequent to the SOX Act effective date (for a calendar year firm, the third quarter of 2002). Section 404 requires the management of accelerated registrants to annually assess and report on the effectiveness of internal controls over financial reporting, beginning with fiscal years ending after November 15, 2004.<sup>8</sup> Section 404 also requires a firm’s auditor to issue an opinion on the effectiveness of the firm’s internal controls.<sup>9</sup>

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<sup>8</sup> “Accelerated registrants” are firms that have: (i) a market capitalization exceeding \$75 million, (ii) been traded on a public exchange for a minimum of 12 months, and (iii) previously filed at least one annual report. Non-accelerated registrants and foreign registrants have been granted additional time to comply with Section 404. While a firm’s Section 404 effective date was determined according to registrant type, Section 302 was uniformly effective for all public registrants beginning on August 29, 2002.

<sup>9</sup> The internal controls opinion is separate but not entirely independent from the financial statement opinion. If a firm’s internal controls are ineffective and the auditor is unable to adequately “audit around” the existing problem areas, this could affect the financial statement opinion issued.

To illustrate how Sections 302 and 404 work in tandem, consider the example of Coeur d'Alene Mines Corporation (Coeur), a calendar year-end firm that trades on the New York Stock Exchange. Coeur reported an initial material weakness pertaining to improper revenue recognition within its June 30, 2004 Form 10-Q. Reporting this material weakness was a mandatory disclosure under Section 302, since it represented a significant change in internal controls from its prior reporting period. Coeur made a similar Section 302 disclosure in its September 30, 2004 Form 10-Q to communicate that it had fully corrected the material weakness, again representing a significant change from the prior period.

Because Coeur met the criteria of an accelerated registrant, it was required to comply with Section 404 for its December 31, 2004 year-end. In its Form 10-K, Coeur identified three new material weaknesses in its Section 404 mandatory disclosure.<sup>10</sup> Consequently, Coeur's management concluded that internal controls over financial reporting were not effective at December 31, 2004, and its independent auditor (KPMG) issued an adverse opinion on the effectiveness of Coeur's internal controls. The adverse opinion signified that KPMG agreed with Coeur's management that the firm's internal controls were ineffective. These disclosures by Coeur's management and KPMG fulfilled the requirements of Section 404.

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<sup>10</sup> As was the case with Coeur, management often incorporated the Section 302 update into its Section 404 report. For this reason, it is important to study both disclosures as the sample period extends into 2005.

## **CHAPTER 3**

### **LITERATURE REVIEW**

Two areas of the accounting literature motivate this paper: (i) information content and disclosure-relevance studies; and (ii) market-based internal control disclosure studies. I review these two literatures below, followed by a discussion of the distinguishing features in the current study.

#### 3.1 Information content and disclosure-relevance studies

A large prior literature establishes that earnings announcements provide information to investors relevant for making resource allocation decisions. The seminal studies of Ball and Brown (1968) and Beaver (1968) were the first to document empirically the association between accounting earnings and stock prices. The main result of Ball and Brown (1968) reveals a consistent, positive association between the sign of firms' unexpected earnings changes and the sign of their unexpected stock returns. The evidence in Beaver (1968) corroborates the general findings of Ball and Brown (1968). Using two alternate measures of information content, price volatility and trading volume, Beaver (1968) observes a pronounced increase in both measures at the time of firms' announcements of earnings. Together, these two studies conclude that the earnings number affects the beliefs and activity of investors, and therefore is a "useful" statistic.

Accounting researchers have considered elements of the financial reporting system other than earnings in succeeding information content studies. One line of research investigates

the incremental contribution of non-earnings financial statement data in explaining stock prices. For example, Lipe (1986) finds that individual components of earnings possess information content incremental to the earnings number. Bowen et al. (1987) and Wilson (1987) find that accruals have information content incremental to that contained in cash flows and earnings. Another line of research examines the information content of footnote disclosures accompanying the financial statements. For instance, Barth et al. (1992) examines the relation between pension expense disclosures and stock prices, while Aboody (1996) finds an incremental association between employee stock option disclosures and stock prices.

Of particular relevance to this paper, information content studies extend to disclosures within statutory filings but independent of the financial statements and footnotes. These studies have established a relation between stock prices and dividend announcements, management comments, and operating data (Hoskin et al., 1986), management discussion and analysis disclosures (Bryan, 1997), and managerial actions (Rajgopal et al., 2002). Finally, accounting researchers have considered events other than the earnings announcement date. Foster et al. (1978, 1983) and Wilson (1986) compare the incremental information content of disclosures reported at the annual report date relative to an earlier period. Easton and Zmijewski (1993), Campbell et al. (2001), and Griffin (2003) examine the investor response at Form 10-K and Form 10-Q filing dates.

Sections 302 and 404 of the SOX Act require that a firm make, at a minimum, a disclosure about the effectiveness of its internal controls within each quarterly and annual SEC filing. This disclosure, like many disclosures required by the Securities Exchange Acts and Regulation S-K, is made outside of the financial statements and accompanying footnotes.

Thus, this paper contributes to the literature on the capital market effects of mandated supplemental disclosures.

### 3.2 Market-based internal control disclosure studies

The financial press has publicized the expectation that capital market participants will build consideration of internal control disclosures into their decision-making models and evaluation criteria.<sup>11</sup> However, recent internal controls studies are inconclusive with regard to the effect of internal control disclosures on directional stock returns. For a sample period that pre-dates the SOX Act, Whisenant et al. (2003) finds an insignificant negative association between stock returns and internal control issues disclosed at the time of firms' auditor changes. The authors hypothesize that the absence of a significant association exists because either internal control issues are predictable or they are confusing and/or lack precision. Bryan and Lilien (2005) finds that mean raw and abnormal returns for a sample of 161 material weakness firms are not different from zero. Likewise, Hammersley et al. (2005), which obtains a sample of 364 internal control issue firms from November 2003 through January 2005, finds that 2-day abnormal returns are not statistically distinguishable from zero. The Bryan and Lilien (2005) and Hammersley et al. (2005) results reconcile with the findings of Whisenant et al. (2003), but are contrary to the conclusions drawn in Beneish et al. (2005) and DeFranco et al. (2005).

Beneish et al. (2005) reports a 3-day abnormal return of -1.71 percent for 336 material weaknesses disclosed during the calendar year 2004. Similarly, DeFranco et al. (2005) reports a 3-day abnormal return of -1.77 percent for a sample of 102 firms reporting internal

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<sup>11</sup> For instance, see "Section 404: How is the Marketplace Likely to Respond to the First Wave of Internal Control Reports?" Ernst & Young Board Matters, April 2005 and "Section 404 Reports on Internal Control: Impact on Ratings Will Depend on Nature of Material Weaknesses Reported." Moody's Investor Service, October 2004.

control issues from November 2003 through December 2004. Test statistics from both of these studies indicate that the abnormal returns are significantly different from zero. Given the mixed evidence in the prior and contemporaneous studies, an open question remains regarding whether internal control disclosures are informative to investors.

### 3.3 Current study

The concluding remarks of Whisenant et al. (2003) include an acknowledgment that “further research is needed to evaluate ... competing explanations regarding the information content of such disclosures.” To this end, I incorporate four distinct sample selection and research design features in an effort to build upon the prior and contemporaneous literature and more closely explore the investor response to internal controls legislation. First, I draw on two information content measures that do not require a model of investor expectations, and therefore study the magnitude of price changes and volume activity without regard to whether internal control disclosures are positive or negative news. A material weakness disclosure could yield a positive signal to the degree that it alleviates prior uncertainty surrounding the firm.<sup>12</sup> Further, the investment may even develop into a positive net present value project, whereby a firm is able to improve its operating performance in future periods in addition to complying with the internal control rules. Conversely, it is difficult to envision the most egregious material weaknesses as anything other than a negative event. Typically, the firms making these disclosures have abundant and/or entrenched internal control problems embedded deep within the organization, leading to a lengthy and costly remediation process.

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<sup>12</sup> American International Group and Symbol Technologies are examples of firms where tremendous uncertainty in prior periods actually produced a large positive movement in stock price at the time of their material weakness disclosures.

Second, I do not rely upon the Compliance Week website (CW) commonly used in recent internal control studies to gather my sample. Rather, I use a keyword search methodology to isolate 1,311 unique firms with internal control issues. Remarkably, more than 600 of these firms are not reported by CW and, more importantly, 231 of the 565 sample firms (41 percent) are not contained within CW.<sup>13</sup> Additionally, I collect the sample over considerably broader time horizon relative to the concurrent studies (to include the first full year of Section 404 reports). Together, these steps preclude the potential selection bias and external validity concerns associated with using CW, to the extent that it is not representative of the population of firms with material weaknesses.

Third, I examine only material weaknesses, which are mandated disclosures in both SOX Act internal control reporting settings. I exclude firms reporting the two types of voluntary internal control deficiencies, significant deficiencies and control deficiencies, because they are less serious infractions and they are not subject to the legal liability risks of those firms with material weaknesses. Additionally, it is not clear that a firm's primary motivation for making voluntary internal control disclosures is to inform the investing public, which opens the door for alternative information asymmetry and incentive stories. Finally, I incorporate a test to assess the incremental effect of Section 404. Because Section 404 is the most criticized and most costly part of the entire SOX Act, it is important to study the effect it has on investors. This paper is the first known study to independently examine Section 404 disclosures.

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<sup>13</sup> The internal controls section of the Compliance Week website contains a disclaimer noting that it does not purport to have an inclusive list of firms with internal control issues, but rather a sampling of reported disclosures.

## **CHAPTER 4**

### **HYPOTHESIS DEVELOPMENT**

If material weakness disclosures prompt investors to rebalance their portfolios, it follows that this piece of information is relevant. There are a host of reasons why it is logical to expect a material weakness disclosure to elicit such a reaction. For example, it provides management with more reliable data for use in decision-making. Additionally, it provides a signal about the firm's governance and oversight mechanisms (Krishnan, 2005) and financial statement quality (Ashbaugh-Skaife et al. (2005) and Doyle et al. (2005)). There are also alternative explanations for why a material weakness disclosure may not be informative. These include: (1) investors believe an unqualified financial statement opinion is an adequate indicator of the credibility of the firm's financial reports; (2) the disclosures are difficult for investors to interpret; and (3) the disclosures are pre-empted by news leaking out ahead of the public filing or through an announcement correlated with the material weakness (i.e., a restatement).

I operationalize "informativeness" using two complementary measures from the prior literature: return volatility and trading volume.<sup>14</sup> I expect a material weakness disclosure to contain information content if: (i) the price changes (apart from whether it increases or decreases) reflecting an aggregation of investors' beliefs, (ii) the volume increases because investors trade on the information, or (iii) both scenarios are observed.

#### 4.1 Unexpected return volatility

Beaver (1968) introduced a measure of unexpected stock return volatility (*URV*), which compares price changes within an event period vis-à-vis price changes outside of the event period. An advantage of this measure is that it captures the magnitude of a firm's price change without regard to the sign. Given that internal controls are a fundamental element of a firm's financial reporting system, uncertainty surrounding the effectiveness of a firm's internal controls may alter investors' beliefs about the future prospects of the firm and lead to a change in equilibrium price at the time of the disclosure. I will interpret an elevated event period *URV* for firms disclosing initial material weaknesses relative to the non-event period and the control sample as containing information content. Accordingly, my first hypothesis, stated in alternative form, is:

H1: The event period return volatility of material weakness-disclosing firms is greater relative to the non-event period and greater than the return volatility of the control sample within the event period.

#### 4.2 Unexpected trading volume

The prior literature has developed a measure that captures investors' activity in addition to their beliefs. This measure, also introduced in Beaver (1968), is unexpected trading volume (*UTV*). Even if the heterogeneous beliefs of investors with respect to a firm's material weakness disclosure result in a marginal directional stock price reaction, it is still conceivable that the disclosure will stimulate investors to trade more actively on the information. Similar to the return volatility expectation, I predict that a significant volume reaction will occur at

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<sup>14</sup> A number of prior studies use one or both of these observable measures of informational value. See, for example, Kiger (1972), Morse (1981), Bamber (1986), Cready and Mynatt (1991), Atiase and Bamber (1994), Kohlbeck and Magilke (2002), and Landsman and Maydew (2002).

the time of a firm's material weakness disclosure. I will interpret an elevated event period *UTV* for firms disclosing initial material weaknesses relative to the two benchmarks (i.e., the non-event period and the control sample) as possessing informational value. Hypothesis 2, stated in alternative form, is:

H2: The event period trading volume of material weakness-disclosing firms is greater relative to the non-event period and greater than the trading volume of the control sample within the event period.

#### 4.3 Incremental information content of Section 404

A large proportion of the negative press from the SOX Act was targeted specifically at the perceived onerous requirements of Section 404. Compared with Section 302, the Section 404 disclosures rules are more specific and the reporting responsibilities of management and its auditor are increased. The interrelation between Sections 302 and 404 creates a setting in which it is possible to observe the investor response to both types of disclosures issued by the same firm. I develop a third hypothesis that measures the incremental effect of a firm's Section 404 adverse opinion conditional on the existence of a prior Section 302 material weakness disclosure.

Presumably, investors have incorporated the information from a firm's prior material weakness disclosure(s) into their future assessment of the firm. For firms that disclose material weaknesses under Section 302 ("302-firms") and subsequently receive an adverse opinion under Section 404, I will interpret the Section 404 disclosures as informative using the same criteria as in hypotheses 1 and 2. Specifically, if those firms exhibit significantly greater price and volume reactions at their adverse opinion date relative to their control firm

matches (who receive a “clean” Section 404 opinion), then the disclosures contain informational value. Consequently, the third hypothesis, stated in alternative form, is:

H3: The values of the information content measures for 302-firms, as computed at the Section 404 reporting date, are greater than the information content measure values of the control sample.

## CHAPTER 5

### RESEARCH DESIGN

To test the hypotheses, I compute  $URV$  and  $UTV$  for each day in the event period,  $[-1,+1]$ , and the non-event period,  $[-10,-2]$  and  $[+2,+10]$ , for both the material weakness sample and the control sample, as follows:

#### 5.1 Information content proxies

Following prior studies that examine return volatility, I compute  $URV$  as the square of a firm's unexpected return (the squared residual after removing market-level effects) standardized by the estimated variance of the firm's unexpected returns. Specifically, the unexpected return volatility measure, as calculated for each firm-day, is:

$$URV = [R_F - (\theta_1 + \theta_2 * R_M)]^2 / RV_{VAR} \quad (1)$$

where  $R_F$  is a firm's raw return,  $R_M$  is the equally-weighted market return from CRSP, and  $\theta_1$  and  $\theta_2$  are coefficient estimates from a firm-specific market model. The denominator,  $RV_{VAR}$ , is the estimated variance of the firm's market model unexpected returns (i.e., the mean squared residual outside of the window  $[-10,+10]$ ).  $\theta_1$ ,  $\theta_2$ , and  $RV_{VAR}$  are calculated in an "estimation period" spanning  $[-250,-11]$ .

Consistent with the prior trading volume literature, I scale a firm's daily trading volume by its daily shares outstanding. I label this unadjusted measure of firm-specific volume  $V_F$ . I adjust  $V_F$  for an "expected volume" proxy,  $E[V_F]$ . I define  $E[V_F]$  as the median of a firm's

trading volume divided by its shares outstanding over the period [-250, -11].<sup>15</sup> Thus, the unexpected trading volume measure, as calculated for each firm-day, is:

$$UTV = V_F - E[V_F] \quad (2)$$

## 5.2 Multivariate model

In testing hypotheses 1 and 2, I attempt to separate the effects of the material weakness disclosure from certain unrelated and potentially confounding effects. For instance, I assume that the average expected effects of changes in wealth, risk and consumption in the short event-window are zero. Likewise, I estimate market model-equivalent regressions to mitigate the effects of macroeconomic factors. Of course, it is likely that additional elements contribute to the behavior of return volatility and/or trading volume at the time of the material weakness disclosure. For instance, a portion of an observed rise in return volatility and/or trading volume may occur because a firm announces the material weakness disclosure simultaneous with its announcement of earnings. Similarly, the announcement of an important piece of industry-specific or firm-specific news concurrent with the material weakness disclosure, such as a regulatory investigation or a restatement, may account for a share of the increase.<sup>16</sup>

To control for these potentially contaminating effects, I construct a model that regresses the set of information content measures on a material weakness variable,  $MW$ , and proxies

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<sup>15</sup> I also consider a variation of  $UTV$  that adjusts  $V_F$  for market effects, analogous to the methodology used in constructing  $URV$ . Untabulated results are qualitatively consistent with those of the primary  $UTV$  measure.

<sup>16</sup> The magnitudes of the information content measures are overstated in a univariate setting that does not control for sources of significant news. However, the relation between the material weakness and control samples should (on average) remain unaltered as long as the composition of news events are comparable across the two samples. However, Panel C of Table 4 shows that each of the explanatory variables occur in differing frequencies (differing magnitudes for  $EA\_D*UE$ ) across the two samples.

for event period news. The resulting empirical specification, which borrows from the research design structure of Landsman and Maydew (2002), is as follows:

$$ICM_i = \alpha_0 + \alpha_1 MW_i + \alpha_2 EA\_D_i + \alpha_3 (EA\_D * UE)_i + \alpha_4 ACC/FIN_i + \alpha_5 LEG/REG_i + \alpha_6 OPER_i + \varepsilon_i \quad (3)$$

*ICM* denotes the set of information content dependent variables,  $\{URV, UTV\}$ . The independent sums of *URV* and *UTV* over the 3-day event period,  $[-1,+1]$ , relative to the material weakness disclosure date  $[0]$  represent the two measures used in the multivariate tests.<sup>17</sup> *URV* and *UTV* are as defined in Sections 4.1. The definitions for the independent variables in Equation 3 are as follows:

- *MW* is an indicator variable that equals 1 if the firm is part of the material weakness sample and 0 if it is part of the control sample (see Section 5.3, “Control Sample”).
- *EA\_D* is an indicator variable that equals 1 if a firm reports earnings within the  $[-1,+1]$  event period, and 0 otherwise.
- For a firm making its internal control disclosure concurrent with an earnings announcement (i.e.,  $EA\_D = 1$ ), *UE* is the magnitude of the firm’s unexpected earnings. *UE* equals  $NI - ANF$ , where *NI* is the actual earnings per share reported by I/B/E/S and *ANF* is the firm’s most recent I/B/E/S consensus analyst earnings per share estimate prior to the event period (a proxy for expected earnings).
- Firm-specific announcements have been partitioned into three distinctive categories of indicator variables that equal 1 if a firm reports a significant news item within the  $[-1,+1]$  event period (other than *EA\_D*), and 0 otherwise. The three categories are: (i)

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<sup>17</sup> The multivariate results are insensitive to the alternative event windows  $[-2,+2]$  and  $[0,+1]$ .

*ACC/FIN*, a proxy for accounting and finance announcements (e.g., restatements, auditor changes, merger and acquisition activity, dividend revisions, analyst and credit rating revisions); (ii) *LEG/REG*, a proxy for legal and regulatory announcements (e.g., lawsuits, IRS and SEC inquiries); and (iii) *OPER*, a proxy for operational announcements (e.g., new customers, new contracts, new product introductions).

### 5.3 Incremental test of Section 404

Hypothesis 3 is a complementary test to hypotheses 1 and 2. If an adverse Section 404 opinion contains new information, then a firm disclosing a material weakness in periods prior to the Section 404 effective date should also experience a significant reaction at the date of its ineffective management assessment and adverse auditor opinion. To test this third hypothesis, I restrict the original material weakness sample to those firms that receive an adverse Section 404 opinion in a period subsequent to their initial Section 302 material weakness disclosure (along with their corresponding control firm matches). I estimate Equation 3 on this sub-sample, where all variables are measured at the adverse opinion date. A significant, positive *MW* coefficient estimate will suggest that Section 404 disclosures contain information incremental to the initial Section 302 disclosure.

## CHAPTER 6

### SAMPLE SELECTION AND DESCRIPTION

#### 6.1 Data sources

Sections 302 and 404 require public registrants to disclose internal control issues within their statutory filings but outside of the financial statements and accompanying footnotes.<sup>18</sup> To identify these initial internal control issues, I used the advanced keyword search on an interface of archived SEC filings maintained by PricewaterhouseCoopers.<sup>19</sup> The sample spans the period August 29, 2002 (the SOX Act inception date) through May 31, 2005 (the end of the first Section 404 reporting period). For this date range, I sequentially searched each SEC filing type on a range of keywords, including ‘material weakness’, ‘significant deficiency’, ‘control deficiency’, ‘control weakness’, ‘reportable condition’, and ‘reportable event’.

Table 1 records the sample selection methodology. For better than half of the sample, it was necessary to retrieve an earlier filing to isolate the initial internal control issue disclosure.<sup>20</sup> At the conclusion of the collection process, the sample consisted of 1,311 internal control issue firms. I eliminated 421 firms that voluntarily disclosed internal control

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<sup>18</sup> Internal control issues are disclosed in Item 9A of the Form 10-K, Item 4 of the Form 10-Q, and in a variety of Form 8-K types.

<sup>19</sup> This interface, known as Edgarscan, is located at [edgarscan.pwcglobal.com/servlets/edgarscan](http://edgarscan.pwcglobal.com/servlets/edgarscan).

<sup>20</sup> Once the initial filing was identified, I determined the precise event date using the SEC EDGAR website timestamp, as found in the “Table of submitted documents” page for each firm. If the timestamp reflected a time that was after the close of the domestic equity markets (i.e., 4:00 p.m. EST), I coded “day 0” as the following trading day.

issues (i.e., significant deficiencies and/or control deficiencies). Of the 890 material weakness firms, I removed 29 firms that were consolidated subsidiaries of a parent company already in the sample and 19 firms where no description of the material weakness was provided. Finally, I eliminated 277 firms that did not have all of the requisite accounting and/or stock market variables. Many firms without complete data either were privately-held or, more commonly, were too small to warrant coverage by one or more of the data providers. These screens reduced the sample to a final count of 565 unique material weakness firms.

To complement the hand-collected internal control disclosure data, I collected additional data necessary to provide a complete descriptive analysis and execute the empirical tests from four electronic databases. These data types and data providers include: accounting variables from Compustat, stock market variables from CRSP, analyst variables from I/B/E/S, and audit variables from Audit Analytics. To conclude the data collection, I created *EA\_D* and the news proxies by reading each firm's SEC filings during [-1,+1] and by performing a firm-by-firm news search using the Factiva business news service spanning the event window [-1,+1].<sup>21</sup>

## 6.2 Material weakness sample firm characteristics

Table 2 and the corresponding untabulated data provide a descriptive profile of the material weakness sample. Beyond having implications for the empirical analysis, these attributes also provide insights into whether the sample appears to map into the general reported trends of this period.

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<sup>21</sup> The event period SEC/Factiva news search is conducted for the material weakness and control samples. I also extend the search one day on each side of the [-1,+1] event period (i.e., [-2,+2]) as a conservative attempt to account for all major firm-specific news in the event period. The primary inferences of Table 5 remain unaltered.

Panel A tabulates seven types of material weakness disclosures, as modeled after the COSO framework. It is common for a firm's disclosure to overlap across classification types. As anticipated, the size of firms with Type 1 issues (inadequate personnel and/or segregation of duties) is substantially below the average firm size. Type 2 issues (deficiencies in policies and procedures) and Type 3 issues (misapplication of GAAP or valuation issues) are the most frequent disclosures types, each occurring in more than 40 percent of the sample. To provide added context to the content of these disclosures, Panel B groups those firms that mention a financial statement account area within their material weakness disclosures. Accounts in which a large degree of discretion is permitted by the accounting rules (income taxes, leases, inventory, and accruals) appear with the greatest regularity.

Panel C tabulates the incidence of miscellaneous sample characteristics. Almost three in ten firms reported more than one material weakness in their internal controls. 80 percent of the sample firms complied with Section 404 and received an opinion from their independent auditor. 70 percent (5 percent) of these firms received adverse (disclaimed) opinions, while the remainder (25 percent) received unqualified opinions.<sup>22</sup> During the sample period, ten percent of the sample were involved in a regulatory investigation and better than half of the sample firms restated their financial statements. The sample includes 7 percent (8 percent) of the Fortune 500 (Fortune 1000), validating PwC CEO DiPiazza's statement that internal control issues are present within many well-known public registrants. Panel D partitions the material weakness sample according to industry, replicating the classification developed by Barth et al. (1998). The distribution is generally in line with the 2004 Compustat population

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<sup>22</sup> The 112 firms without a Section 404 opinion are split between non-accelerated registrants (N=101) and foreign registrants (N=11).

of firms, with the exception of a larger concentration of computer and retail firms and a smaller concentration of financial firms.<sup>23</sup>

A first set of untabulated descriptive statistics examines material weakness sample firms by stock exchange and SEC filing type. NASDAQ firms (61 percent) outnumber New York Stock Exchange firms (30 percent) by a 2-to-1 ratio and American Stock Exchange firms (9 percent) by more than a 6-to-1 ratio. With respect to filing type, the majority of initial material weakness disclosures appear in the 10-K form class (58 percent), with the remainder evenly split between the 10-Q form class and the 8-K/Other form class (21 percent each).

A second set of untabulated descriptive statistics considers auditor characteristics of the material weakness sample. The Big 4 public accounting firms service more than 80 percent of the sample. KPMG and PwC audit more firms with material weaknesses as a percentage of their total audit revenues than do Deloitte & Touche or Ernst & Young. More than one-third of the material weakness firms change auditors during the sample period, typically in the time surrounding the material weakness disclosure. Interestingly, 115 firms moved from Big 4 to non-Big 4 firms, while only 8 firms “upgraded” to the Big 4 firms from the non-Big 4 firms. Finally, the change in audit fees reported by material weakness firms is in line with the anecdotal evidence quantifying the economic burden of internal controls compliance.<sup>24</sup>

The mean (median) total audit fees for the material weakness sample in the year of the material weakness disclosure are 2.3 times (1.9 times) total audit fees in the immediately

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<sup>23</sup> The greater proportion of computer firms is at least partially attributable to firm size, with more than two-thirds of the material weaknesses reported by these firms relating to Type 1 or Type 2 issues. The larger incidence of retail firms is primarily due to firms modifying their accounting for leases and leasehold improvements to comply with the guidance issued by the Office of the Chief Accountant of the SEC on February 7, 2005. The smaller percentage of financial firms is likely a manifestation of similar internal control regulatory requirements governing these firms before the SOX Act (FDICIA, 1991).

<sup>24</sup> “The Costs of Being Public in the Era of Sarbanes-Oxley”, Foley & Lardner LLP, June 16, 2005.

preceding year and 4.8 times (3.9 times) the base year (generally 2000, the first SEC-mandated year for audit fee disclosures).

### 6.3 Control sample

To estimate Equation 3, it is necessary to have variation in the *MW* variable. However, the original material weakness sample contains a uniform set of firms reporting material weakness disclosures, where the *MW* indicator variable is equal to one in every case. A technique for achieving the requisite variation is to form a matched sample of control firms. The ideal control match is a firm that is homogeneous to its prospective material weakness counterpart across all attributes except for the content of its internal control disclosure.

To collect this matched sample, I first eliminate from the set of potential candidates all firms disclosing internal control issues during the post-SOX Act period.<sup>25</sup> Next, I omit candidates with insufficient stock market or accounting data during the [-1,+1] event period or the [-250,-11] estimation period. Finally, I match each firm in the material weakness sample with a control firm on four sequential dimensions: industry (2-digit SIC code), size (total asset decile, and then the closest level of total assets within the decile), filing type (annual or quarterly statutory filing), and time (fiscal year-end and year).<sup>26</sup> Each of the resulting 565 control firms is identical to its material weakness firm match on all four

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<sup>25</sup> To ensure that I draw the control firms from an uncontaminated population, I collect all firms disclosing any of the three types of internal control issues from August 2002 through May 2005. The residual of firms listed in the Compustat annual file report no internal control issues during the sample period and represent the group from which I select the control sample.

<sup>26</sup> Recent internal control studies (Ashbaugh-Skaife et al. (2005), Bryan and Lilien (2005), Doyle et al. (2005), and Ge and McVay (2005)) find that determinants of material weaknesses include complexity, profitability, and growth. I consider incorporating these determinants into my matching technique; however, adding one or more of these additional screens results in many unmatched firms. Even so, I indirectly control for these additional determinants through the size measure. Unreported correlations, computed separately for the material weakness and control samples, confirm that size is positively correlated with complexity (number of operating segments) and profitability (return on assets), and negatively correlated with growth (annual change in sales), which reconciles with the findings of these recent studies.

dimensions, with the exception of a handful of cases in which it was necessary to relax the fiscal year-end restriction.<sup>27</sup>

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<sup>27</sup> I establish for each control firm a 3-day event period centered on its Form 10-K or Form 10-Q filing date and as close to the event date of its corresponding material weakness match as possible. The majority of control firm disclosures are made during the same week as their material weakness match, with exceptions occurring when the material weakness firm: (i) discloses its initial material weakness with an earnings or restatement announcement; (ii) delays its 10-K or 10-Q filing; or (iii) does not have the same fiscal year end as its control firm match.

## CHAPTER 7

### EMPIRICAL RESULTS

#### 7.1 Abnormal returns tests

Before testing my hypotheses, I first replicate the abnormal returns tests conducted by concurrent internal control studies using my expanded sample. An abnormal return,  $AR$ , is computed for each sample firm within the  $[-1,+1]$  event period.  $AR$  equals a firm's cumulated 3-day raw return less an expected return. The expected return proxy is the value-weighted market return from CRSP cumulated over the 3-day event period. The distribution of  $AR$  for the material weakness sample is presented in Figure 1. The distribution unexpectedly resembles a normal distribution, with only the slightest indication of left-tail asymmetry. Given this evidence, I do not make a prediction on how a firm's material weakness disclosure will affect its stock price.

Table 3, Panel A provides a univariate comparison of the abnormal return variable between the material weakness and control samples. The mean  $AR$  for the material weakness sample is statistically different from the control sample  $AR$  at the five-percent level. However, the median  $AR$  for the material weakness sample is only marginally significant from the control sample (at the ten-percent level). Furthermore, the mean material weakness sample  $AR$  is not significantly different from zero (t-statistic of  $-1.55$ ). Table 3, Panel B provides the results from estimating Equation 3 with  $AR$  as the dependent variable. The coefficient on  $MW$  is statistically significant at the five-percent level for the full sample of

material weakness disclosures. Then again, this result is sensitive to extreme  $AR$  values, as the coefficient is only marginally significant when the abnormal return observations are winsorized to the 1-percent and 99-percent levels. Analogous to the concurrent internal control studies, the results and interpretation of the abnormal returns tests straddle the line between significance and insignificance, depending on how extreme values are treated and whether or not a prediction is made on the relation between material weakness disclosures and stock returns.

## 7.2 Univariate analysis

Turning to Figure 2, as hypothesized, the “Beaver spike” is present in the event period for both the return volatility and trading volume measures. The first graph plots  $URV$  means for the material weakness and control samples over the  $[-10,+10]$  horizon. The  $URV$  mean in the  $[-1,+1]$  event period is 1.9 times the  $URV$  mean in the  $[-10,-2]$ ,  $[+2,+10]$  non-event period. Within the event period, the  $URV$  mean for the material weakness sample is 1.9 times the corresponding control sample  $URV$  mean. The second graph in Figure 2 depicts the trading volume response to material weakness disclosures in the event period relative to the non-event period and the control sample. The material weakness sample  $UTV$  mean in the event period is 2.0 times the respective  $UTV$  mean in the non-event period. Likewise, within the event period, the material weakness sample  $UTV$  mean is 1.7 times the control sample  $UTV$  mean.

Figure 2 indicates that the return volatility and trading volume responses are most pronounced on days 0, 1, and 2. Statistical tests of difference in means and medians corroborate the graphical evidence. The t-statistics and z-statistics reported in Table 4, Panel A reveal that the  $URV$  and  $UTV$  means and medians within the event period are significantly

larger for the material weakness sample relative to the control sample. Untabulated t-statistics and z-statistics also establish that, for the material weakness sample, both event period information content measures have statistically larger means and medians than their non-event period equivalents.

The economic significance of the return volatility and trading volume measures mirrors the findings of prior studies (Beaver (1968) and Landsman and Maydew (2002), among others). The average return volatility on day 0 for the material weakness sample is nearly double the non-announcement period benchmark value of 1.0. Similarly, expressing in trading volume in economic terms, for every 10 shares traded by material weakness-disclosing firms in the event period, 5.1 shares are traded by the same firms in the non-event period and 5.7 shares are traded by the matched sample of control firms.

Overall, the univariate results are consistent with the first and second hypotheses. Additionally, Panel B of Table 4 confirms that *MW* is significantly correlated with both measures of information content. However, several of the explanatory variables are also significantly correlated with one another. For example, the correlation between *MW* and *ACC/FIN* and the correlation between *EA\_D* and its interaction with *UE* are positively correlated. I examine the independent contributions of each explanatory variable in predicting *URV* and *UTV* in the subsequent multivariate analysis.

### 7.3 Multivariate analysis

To test the predictions of hypotheses 1 and 2 in the multivariate setting, I estimate Equation 3 for the full sample of initial material weakness disclosures and report the regression summary statistics in Table 5. As predicted, the coefficient on the primary variable of interest, *MW*, is positive and statistically significant at the one-percent level in

both the *URV* and *UTV* models. This result suggests that initial material weakness disclosures elicit a response by investors, consistent with investors using the information to make resource allocation decisions.

The coefficient on the concurrent earnings announcement variable, *EA\_D*, and the interaction of *EA\_D* with *UE* are also positive and significant in both models, consistent with the evidence in Beaver (1968) and other information content studies. This result indicates that the existence of an earnings announcement, as well as the magnitude of the earnings surprise, provides additional information to investors.<sup>28</sup> Two of the three control variables for potentially confounding event period news are a determinant of the information content measures in one or both of the empirical specifications. The coefficient on *ACC/FIN*, the proxy for accounting and finance firm-specific news, is positive and significant in both the *URV* and *UTV* models, while the coefficient on *LEG/REG* is significant in the *UTV* model.<sup>29</sup>

#### 7.4 Ranking *MW* types by level of severity

In Table 5, each material weakness disclosure is weighted equally. However, it is plausible that investors consider the severity of a firm's material weakness(es) when updating their beliefs about the firm. To determine whether investors' responses vary according to material weakness type, I aggregate the categories of Table 2, Panel A into a "more severe" group (MORE) and a "less severe" group (LESS) and estimate Equation 3 separately for each group. MORE contains firms with GAAP or valuation deficiencies (excluding leases), revenue recognition issues, control environment concerns, or three or more types of material

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<sup>28</sup> Explanatory variables controlling for the effects of prior earnings announcements and earnings surprises were also included in an expanded version of Equation 3. Neither coefficient was significantly related to *URV* or *UTV*.

<sup>29</sup> I adjust the OLS standard errors for each coefficient estimate in Table 5 by the White (1980) heteroscedasticity consistent estimator. This correction does not affect any inferences with the exception that the coefficient on *LEG/REG* in the *UTV* model turns from significant at the 5-percent level to insignificant.

weaknesses. LESS includes firms disclosing inadequate staffing and/or segregation of duties, insufficient reconciliation or review procedures, lease-related GAAP deficiencies, and information technology issues.

I expect the probability that MORE firms have abundant and/or entrenched problems that may result in distorted financial reports will be greater than LESS firms. Accordingly, I predict that those firms with MORE weakness types will elicit a stronger *URV* and *UTV* response from investors relative to LESS weakness types. The ranking scheme is validated by partitioning Figure 1 according to material weakness type. A large proportion of MORE firms reside in the tails, while LESS firms generally populate the center of the distribution. As added support for this prediction, Table 6 confirms that the *MW* coefficient is significant at the one-percent level in both models of information content for MORE, while the *MW* coefficient is significant at the ten- (five-) percent level in the LESS *URV* (*UTV*) models.

### 7.5 Incremental information content test

Table 7 presents the regression summary statistics from testing the hypothesis of whether Section 404 disclosures are incrementally informative to investors. Equation 3 is re-estimated at the adverse opinion date for the reduced sample of firms disclosing an initial material weakness in periods before Section 404 took effect. The coefficient on the variable of interest, *MW*, is statistically significant at the five-percent level in both the *URV* and *UTV* models, which, although not as strong as the main result, is consistent with hypothesis 3. The finding that the investor reaction to firms' Section 404 adverse opinions is dampened relative to their initial Section 302 disclosures (a strong predictor of a Section 404 adverse opinion) is consistent with a result in Chen and Church (1996), which finds that the stock market

reaction to firms' bankruptcy filings is reduced relative to their prior going concern opinions (a strong predictor of bankruptcy).

Further analysis reveals that a time element is a partial explanation for this result. Firms making their initial Section 302 disclosures in close proximity to the Section 404 adverse opinion (SHORT) have a comparatively larger reaction than firms with a sizeable time gap between their Section 302 and Section 404 disclosures (LONG).<sup>30</sup> This pattern is consistent with the result of a prior study by Elliott and Hanna (1996). Elliott and Hanna (1996) finds that information content decreases monotonically as additional disclosures of the same type (in their case, special items) are made. LONG firms have provided at least three additional updates about the status of their material weakness(es) in annual/quarterly filings between the initial disclosure and the adverse opinion. To the contrary, the Section 404 disclosure is likely the first update that SHORT firms have provided since their initial disclosure. Thus, it is logical that the market is more attuned to the information in SHORT filings. Taken as a whole, the results of Table 7 suggest that investors find incremental information in Section 404 disclosures when a firm has previously reported a material weakness under Section 302.

## 7.6 Robustness checks

I carry out several untabulated tests to establish that the primary result of Table 5, a positive relation between  $MW$  and  $URV/UTV$ , is robust to alternative specifications and sample partitions. First, I delete firms with concurrent event period news (earnings and other firm-specific news announcements) and re-estimate Equation 3. To the extent that the control variables do not precisely capture the effects of contemporaneous event period news,

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<sup>30</sup> SHORT is defined as those firms with less than 60 trading days (i.e., one quarter) between the initial material weakness disclosure and the adverse opinion. LONG is defined as those firms where greater than 250 trading days (i.e., one year) has elapsed between the initial material weakness disclosure and the adverse opinion.

this sub-sample test calibrates the effect of a material weakness disclosure in the cleanest setting possible. Upon omitting all material weakness firms with event period news (along with their accompanying control sample matches), the coefficient on *MW* remains significant at the one-percent level across both the *URV* and *UTV* models.

Both the *URV* and *UTV* distributions are positively skewed, and therefore violate the classical OLS assumption of normality. Table 5 attempts to mitigate the effect of outlying values by winsorizing the *URV* and *UTV* distributions at the 1-percent and 99-percent levels. To further alleviate the concern that extreme values may be driving the result, I re-estimate Equation 3 after transforming *URV* and *UTV* by ranking them and by taking their natural logarithm. The inferences of Table 5 are unaffected by these transformations.

Finally, in the primary multivariate analysis I assume that investors place equal weight on the disclosures made under Sections 302 and 404. However, it is conceivable that investors will react differently to disclosures made under these two SOX Act subsections, particularly since Section 404 requires additional reporting by both management and its auditor. To verify that one of the SOX Act subsections is not driving the results, I estimate Equation 3 separately for Section 302 and 404 disclosures. I find that the positive relation between *MW* and the information content measures persists in both sub-samples. It is somewhat surprising, however, that the *MW* coefficients and t-statistics are larger in the Section 302 models (significant at the one-percent level) as compared with the Section 404 models (significant at the five-percent level).

## **CHAPTER 8**

### **CONCLUSIONS AND FUTURE RESEARCH**

#### 8.1 Conclusions

Prior to the Sarbanes-Oxley Act of 2002, an absence of publicly accessible data precluded accounting researchers from studying internal controls. A primary emphasis of the SOX Act centers on expanding corporate disclosure requirements and, in particular, on the internal control disclosure requirements as enforced by Sections 302 and 404. This unanticipated shift in the internal control disclosure regime has supplied an opportune setting to document and test the effects of internal control disclosures.

This paper uses a sample of initial material weaknesses reported by firms between August 2002 and May 2005 to study price and volume responses to internal control disclosures. Univariate tests detect pronounced and statistically significant event period return volatility and trading volume responses to material weakness disclosures, as compared with the same sample in a bordering non-event period and a control sample of non-internal control issue firms. Cross-sectional regression models of return volatility and trading volume reveal that a significant, positive relation between firms' material weakness disclosures and the two measures of information content persists after controlling for multiple sources of event period news.

The results of this study extend the existing market-based internal control studies by providing a more complete picture of the relation between internal control disclosures and

observable measures of informational value. The indication that investors find these disclosures informative suggests that the internal control legislation instituted by the SOX Act has supplied at least some benefits to the capital markets, irrespective of whether the legislation is viewed as effective or ineffective. This evidence is timely and instructive for policymakers, as they continue to refine accounting and auditing standards and with the second year of Section 404 reporting well underway.

## 8.2 Future research

The analyses in Sections 7.3 and 7.4 provide some indication of how investors perceive the initial news of a material weakness in internal controls. To corroborate these findings, a sensible next step is to examine firms' material weakness disclosures over time. This analysis is viable because Sections 302 and 404 collectively require an update on the status of firms' internal controls in each quarterly and annual SEC filing.

Section 7.5 takes a first pass by comparing firms' initial Section 302 material weakness disclosures with their ensuing Section 404 adverse internal controls opinion. However, studying broader intertemporal patterns in firms' material weakness disclosures (i.e., quarter by quarter over several periods beyond the initial announcements) will help to sort out the duration over which firms' systems of internal controls remain deficient and the degree to which capital market participants respond to remediation actions taken by the firm. This time series analysis has the added advantage of eliminating the need to predict whether a material weakness disclosure is good news or bad news, since a firm's succeeding internal control disclosures can be evaluated relative to its initial material weakness disclosure.

A firm's performance following its initial material weakness disclosure will likely be a decreasing function of its time to remediate. A preliminary inspection of the patterns of

sample firms' remediation efforts reveals that firms disclosing material weaknesses fall somewhere on a continuum consisting of two extremes. At the one extreme are firms that disclose a material weakness and correct it quickly, occasionally even within the same quarter in which it is discovered. It is unlikely that these firms will suffer anything other than a temporary setback in stock price and/or operating performance. At the other extreme are firms that disclose a material weakness and need multiple statutory filing periods to correct it. These firms often uncover additional material weaknesses during the remediation stage, which prolongs their non-conforming status. The market will almost certainly penalize these firms, as investors and other capital market participants begin to question more than the quality of their internal control systems.

## Appendix:

### Variable definitions

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NOTE: These variable definitions pertain to the ensuing figures and tables.

$AR$  is the market-adjusted abnormal return over the  $[-1,+1]$  event window relative to event date  $[0]$ . It equals a firm's cumulated raw return less an expected return, measured as the cumulated value-weighted market return from CRSP.

$URV$  is unexpected return volatility, and equals  $RV_{AVE} / RV_{VAR}$  summed over the  $[-1,+1]$  event window relative to event date  $[0]$ .  $RV_{AVE}$  is the square of  $R_F - (\theta_1 + \theta_2 * R_M)$ , where  $R_F$  is a firm's cumulated raw return,  $R_M$  is the equally-weighted market return from CRSP, and  $\theta_1$  and  $\theta_2$  are coefficient estimates from a firm-specific market model.  $RV_{VAR}$  is the estimated variance of the firm's market model unexpected returns (i.e., the mean squared error).  $\theta_1$ ,  $\theta_2$ , and  $RV_{VAR}$  are calculated in the  $[-250,-11]$  estimation period.

$UTV$  is unexpected trading volume, computed as  $V_F$  less the median  $V_F$  in the  $[-250,-11]$  non-event estimation period. This difference is summed over the  $[-1,+1]$  event window relative to event date  $[0]$ .  $UTV$  was transformed by a power of  $10^2$  for expositional purposes.

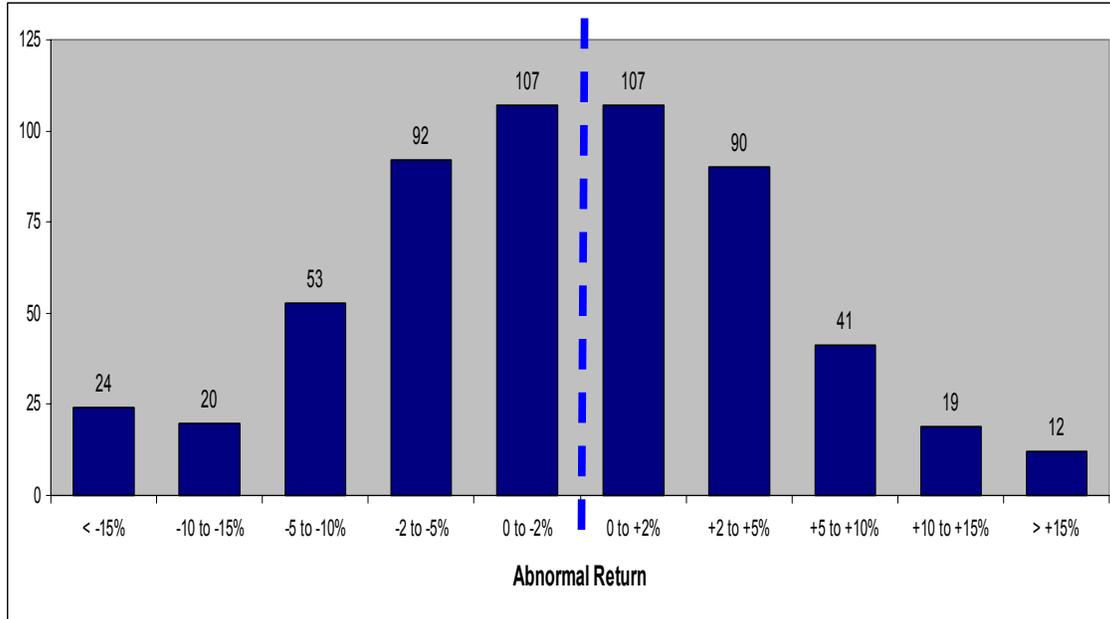
$MW$  is an indicator variable that equals 1 if the firm is part of the material weakness sample and 0 if it is part of the control sample (see Section 5.3, "Control Sample").

$EA\_D$  is an indicator variable that equals 1 if a firm reports earnings within the  $[-1,+1]$  event period, and 0 otherwise. For a firm making its internal control disclosure concurrent with an earnings announcement (i.e.,  $EA\_D = 1$ ),  $UE$  is the magnitude of the firm's unexpected earnings.  $UE$  equals  $NI - ANF$ , where  $NI$  is the actual earnings per share reported by I/B/E/S and  $ANF$  is the firm's most recent I/B/E/S consensus analyst earnings per share estimate prior to the event period (a proxy for expected earnings).

Firm-specific announcements have been partitioned into three distinctive categories of indicator variables that equal 1 if a firm reports a significant news item within the  $[-1,+1]$  event period (other than  $EA\_D$ ), and 0 otherwise. The three categories are: (i)  $ACC/FIN$ , a proxy for accounting and finance announcements (to include restatements, auditor changes, merger and acquisition activity, dividend revisions, analyst and credit rating revisions), (ii)  $LEG/REG$ , a proxy for legal and regulatory announcements (to include lawsuits, IRS and SEC inquiries), and (iii)  $OPER$ , a proxy for operational announcements (to include new customers, new contracts, new product introductions).

**Figure 1:**

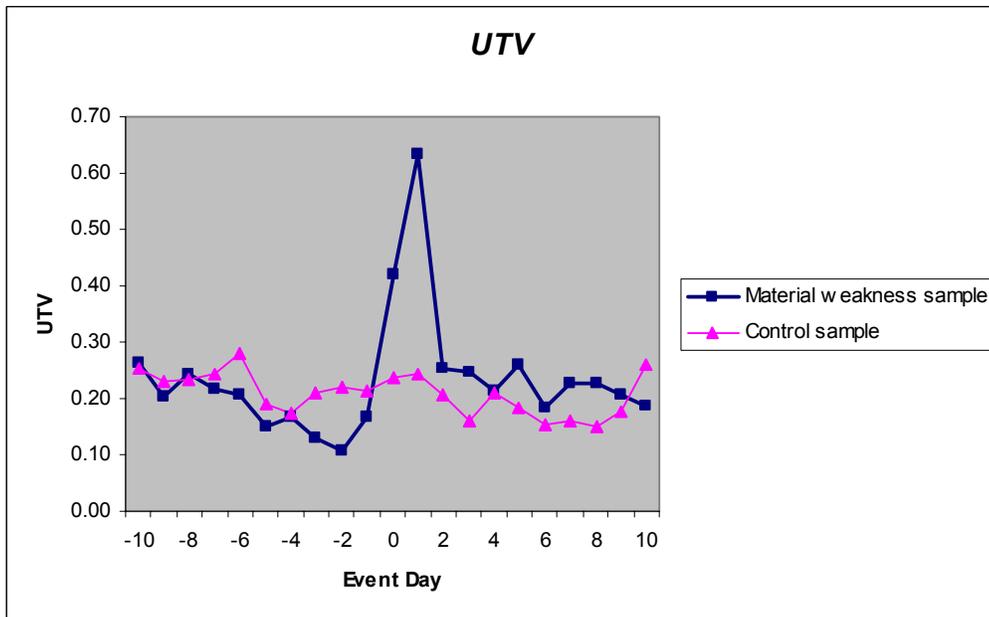
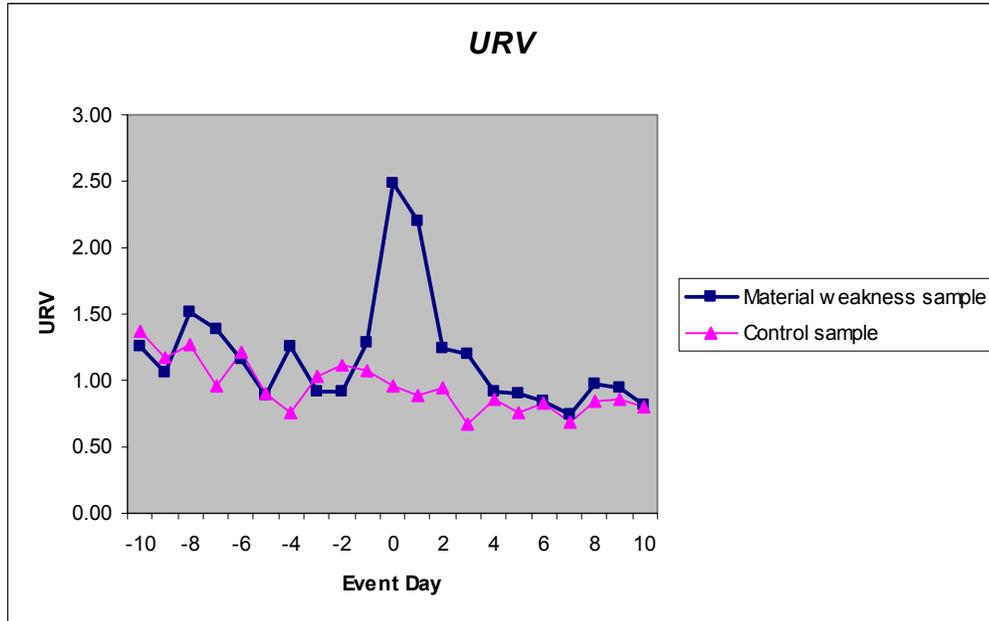
**Distribution of abnormal returns for material weakness firms**



The abnormal return is computed as a firm's cumulated raw return for the [-1,+1] event period less the cumulated value-weighted market return over the identical event period.

Figure 2:

URV and UTV over the window [-10,+10]



The *URV* mean in the event period is 1.9 times the non-event period *URV* mean and 2.1 times the event period control sample mean. The *UTV* mean in the event period is 2.0 times the non-event period *UTV* mean and 1.8 times the event period control sample mean. The event period is defined as [-1,+1] and the non-event period is defined as [-10,-2] and [+2,+10], both relative to event day [0].

**Table 1:**  
**Sample selection**

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Unique firms with initial internal control issues	1,311
Less: Internal control issues not rising to the level of material weakness	(421)
<b>Initial material weakness disclosures</b>	<b>890</b>
Less: Consolidated subsidiary of a parent company already in the sample	(29)
No description of the material weakness is provided	(19)
Incomplete Compustat and/or CRSP data *	(277)
<b>Final sample</b>	<b>565</b>

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\* The loss of these material weakness-disclosing firms is primarily a function of size. In large part, these firms trade on over-the-counter exchanges and are considered too small to merit coverage by the commercial data providers. Firms without public equity also contribute to this number.

**Table 2:**  
**Material weakness sample firm characteristics**

PANEL A: Material weaknesses by classification type

Type 1: Personnel, segregation of duties	135	23.9%
Type 2: Reconciliations, review, monitoring, classification	248	43.9%
Type 3: Application of GAAP, valuation of account-specific items	248	43.9%
Type 4: Revenue recognition	63	11.2%
Type 5: Information technology or information systems	23	4.1%
Type 6: Control environment	34	6.0%
Type 7: Three or more types of material weaknesses	78	13.8%

PANEL B: Material weaknesses by financial statement account area

Income taxes	85	15.0%
Leases	72	12.7%
Inventory	55	9.7%
Accruals	51	9.0%
Long-term assets	42	7.4%
Investments	33	5.8%
Stock options	32	5.7%
Derivatives	28	5.0%

PANEL C: Miscellaneous sample characteristics

Greater than 1 material weakness	164	29.0%
404 opinion issued by auditor	453	80.2%
Ineffective internal control opinion		
- Adverse	318	70.2%
- Disclaimer	23	5.1%
Regulatory investigation	55	9.7%
Restatement	312	55.2%
Fortune 500 firm	33	5.8%
Fortune 1000 firm	80	14.2%

**Table 2 (continued):****Material weakness sample firm characteristics**

## PANEL D: Industry composition

<i>Industry</i>	<i>SIC Codes</i>	<i>MW sample</i>		<i>2004 Compustat</i>	
Chemicals	2800-2824, 2840-2899	9	1.6%	161	2.1%
Computers	3570-3579, 3670-3679, 7370-7379	113	20.0%	1102	14.3%
Extractive	1300-1399, 2900-2999	22	3.9%	269	3.5%
Financial	6000-6411	61	10.8%	1140	14.8%
Food	2000-2111	6	1.1%	144	1.9%
Insurance/Real Estate	6500-6999	17	3.0%	376	4.9%
Manufacturing	3000-3569, 3580-3669, 3680-3999	102	18.1%	1410	18.3%
Mining/Construction	1000-1299, 1400-1999	10	1.8%	206	2.7%
Pharmaceuticals	2830-2836	29	5.1%	471	6.1%
Retail	5000-5999	73	12.9%	622	8.1%
Services	7000-7369, 7380-8999	57	10.1%	643	8.3%
Textiles/Print/Publish	2200-2780	16	2.8%	257	3.3%
Transportation	4000-4899	33	5.8%	447	5.8%
Utilities	4900-4999	16	2.8%	331	4.3%
Other	9000+	1	0.2%	129	1.7%

**Table 3:****Tests of directional abnormal stock returns**

## PANEL A: Univariate statistics

	<i>Treatment sample</i>			<i>Control sample</i>			Prediction	t-stat <sup>a</sup>	z-stat <sup>b</sup>
	Mean	Median	Std	Mean	Median	Std			
<i>AR</i>	-0.54	-0.20	0.08	0.28	0.11	0.05	(?)	-2.01*	-1.66

<sup>a</sup> The t-statistic is a t-test for a difference in means between the material weakness and control samples.

<sup>b</sup> The z-statistic is a Mann-Whitney-Wilcoxon test for a difference in medians between the material weakness and control samples.

## PANEL B: Regression summary statistics

$$AR_i = \alpha_0 + \alpha_1 MW_i + \alpha_2 EA\_D_i + \alpha_3 (EA\_D * UE)_i + \alpha_4 ACC/FIN_i + \alpha_5 LEG/REG_i + \alpha_6 OPER_i + \varepsilon_i$$

	Prediction	<i>Full sample</i>	<i>Winsorizing 1% and 99%</i>
Intercept	(?)	0.004	0.002
t-stat		1.07	0.80
<i>MW</i>	(?)	-0.009	-0.006
t-stat		-2.25*	-1.73
<i>EA_D</i>	(?)	-0.003	-0.004
t-stat		-0.45	-0.64
<i>EA_D*UE</i>	(+)	0.022	0.022
t-stat		2.21*	2.52**
<i>ACC/FIN</i>	(?)	-0.017	-0.009
t-stat		-3.13**	-1.91
<i>LEG/REG</i>	(?)	0.017	0.017
t-stat		1.69	1.86
<i>OPER</i>	(?)	-0.002	-0.002
t-stat		-0.26	-0.32
Adjusted R <sup>2</sup>		0.02	0.02
# of Obs		1,130	1,130

\*\* and \* denote significance at the 1% and 5% levels, respectively (a one-tailed test statistic when a prediction on the sign is made and a two-tailed test statistic otherwise). All variables are as defined in Appendix 1.

**Table 4:****Univariate tests of the treatment and control samples**

PANEL A: Univariate statistics for the information content variables

	<i>Treatment sample</i>			<i>Control sample</i>			Prediction	t-stat <sup>a</sup>	z-stat <sup>b</sup>
	Mean	Median	Std	Mean	Median	Std			
<i>URV</i>	5.26	1.74	10.05	2.90	1.41	4.68	(+)	4.98**	3.31**
<i>UTV</i>	1.28	0.30	2.76	0.66	0.15	1.83	(+)	4.38**	3.81**

\*\* and \* denote significance at the 1% and 5% levels, respectively (a one-tailed test statistic when a prediction on the sign is made and a two-tailed test statistic otherwise).

<sup>a</sup> The t-statistic is a t-test for a difference in means between the material weakness and control samples.

<sup>b</sup> The z-statistic is a Mann-Whitney-Wilcoxon test for a difference in medians between the material weakness and control samples.

PANEL B: Correlations

	<i>URV</i>	<i>UTV</i>	<i>MW</i>	<i>EA_D</i>	<i>EA_D*UE</i>	<i>ACC/FIN</i>	<i>LEG/REG</i>	<i>OPER</i>
<i>URV</i>	–	<b>0.39</b>	<b>0.15</b>	<b>0.22</b>	<b>0.11</b>	<b>0.08</b>	–0.01	0.01
<i>UTV</i>	<b>0.38</b>	–	<b>0.13</b>	<b>0.13</b>	<b>0.09</b>	<b>0.07</b>	<b>0.07</b>	0.03
<i>MW</i>	<b>0.10</b>	<b>0.12</b>	–	<b>0.11</b>	<i>–0.08</i>	<b>0.12</b>	<b>0.11</b>	<b>–0.08</b>
<i>EA_D</i>	<b>0.17</b>	<b>0.16</b>	<b>0.11</b>	–	<b>0.52</b>	0.01	0.01	–0.01
<i>EA_D*UE</i>	<b>0.10</b>	<i>0.08</i>	<i>–0.07</i>	<i>0.07</i>	–	0.02	–0.02	–0.02
<i>ACC/FIN</i>	<i>0.05</i>	<b>0.07</b>	<b>0.12</b>	0.01	0.05	–	<i>0.05</i>	–0.03
<i>LEG/REG</i>	0.01	0.04	<b>0.11</b>	0.01	<i>–0.06</i>	<i>0.05</i>	–	<b>0.07</b>
<i>OPER</i>	–0.01	0.03	<b>–0.08</b>	–0.01	–0.05	–0.03	<b>0.07</b>	–

Pearson product-moment correlations are above the diagonal and Spearman rank-order correlations are below the diagonal. Correlations in bold (italics) are significant at the 1% (5%) level.

PANEL C: Explanatory variables

	<i>Treatment sample mean</i>	<i>Control sample mean</i>
<i>MW</i>	1.00	0.00
<i>EA_D</i>	0.22	0.15
<i>EA_D*UE</i>	–0.05	0.01
<i>ACC/FIN</i>	0.27	0.18
<i>LEG/REG</i>	0.06	0.02
<i>OPER</i>	0.09	0.14

NOTE: All variables in this table are as defined in Appendix 1.

**Table 5:****Return volatility and trading volume regressions**

Summary statistics from cross-sectional regressions of the information content measures on the material weakness variable and controls for event period news

$$ICM_i = \alpha_0 + \alpha_1 MW_i + \alpha_2 EA\_D_i + \alpha_3 (EA\_D * UE)_i + \alpha_4 ACC/FIN_i + \alpha_5 LEG/REG_i + \alpha_6 OPER_i + \varepsilon_i$$

	Prediction	<i>URV</i>	<i>UTV</i>
Intercept	(?)	1.946	0.427
t-stat		5.25**	3.78**
<i>MW</i>	(+)	2.052	0.566
t-stat		4.36**	3.94**
<i>EA_D</i>	(+)	4.159	0.749
t-stat		6.86**	4.07**
<i>EA_D*UE</i>	(+)	1.552	0.909
t-stat		3.00**	2.56**
<i>ACC/FIN</i>	(+)	2.057	0.423
t-stat		3.25**	2.19*
<i>LEG/REG</i>	(+)	-1.082	0.702
t-stat		-0.93	1.97*
<i>OPER</i>	(+)	0.497	0.260
t-stat		0.68	1.15
Adjusted R <sup>2</sup>		0.07	0.04
# of Obs		1,130	1,130

\*\* and \* denote significance at the 1% and 5% levels, respectively (a one-tailed test statistic when a prediction on the sign is made and a two-tailed test statistic otherwise). *ICM* is the set of information content dependent variables {*URV*, *UTV*}. All other variables are as defined in Appendix 1. *URV* and *UTV* are winsorized at the 1% and 99% levels to mitigate the effect of outliers.

NOTE: This model is estimated on a sample of 1,130 firms: 565 from the material weakness sample reporting an initial material weakness disclosure, along with the corresponding 565 matched firms from the control sample.

**Table 6:**

**Partitioned material weakness variable regressions**

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Summary statistics from cross-sectional regressions where the material weakness firms are divided into a more severe group (MORE) and less severe group (LESS).

$$ICM_i = \alpha_0 + \alpha_1 MW_i + \alpha_2 EA\_D_i + \alpha_3 (EA\_D * UE)_i + \alpha_4 ACC/FIN_i + \alpha_5 LEG/REG_i + \alpha_6 OPER_i + \varepsilon_i$$

	<i>URV</i>		<i>UTV</i>	
	<i>MW</i> coefficient	t-stat	<i>MW</i> coefficient	t-stat
MORE	1.973	4.16**	0.484	3.56**
LESS	1.417	1.58	0.344	1.71*

---

\*\* and \* denote significance at the 1% and 5% levels, respectively (one-tailed test statistic). *ICM* is the set of information content dependent variables {*URV*, *UTV*}. All other variables are as defined in Appendix 1. The observations winsorized in Table 5 remain winsorized in this sub-sample.

NOTE: The MORE *ICM* models are estimated on a sample of 346 firms: 173 from the material weakness sample along with the corresponding 173 matched firms from the control sample. The LESS *ICM* models are estimated on a sample of 286 firms (143 each from the material weakness and control samples). The remaining 498 firms (249 material weakness firms and 249 corresponding control firms) had more than one type of material weakness.

**Table 7:****Section 404 incremental information content regressions**

Summary statistics from cross-sectional regressions of “302-firms” receiving a subsequent adverse opinion, where  $URV$  and  $UTV$  are computed in the  $[-1,+1]$  event period surrounding the Section 404 adverse opinion date [0]

$$ICM_i = \alpha_0 + \alpha_1 MW_i + \alpha_2 EA\_D_i + \alpha_3 (EA\_D * UE)_i + \alpha_4 ACC/FIN_i + \alpha_5 LEG/REG_i + \alpha_6 OPER_i + \varepsilon_i$$

	Prediction	$URV$	$UTV$
Intercept	(?)	1.928	0.239
t-stat		2.47*	1.81
$MW$	(+)	1.877	0.341
t-stat		1.86*	1.92*
$EA\_D$	(+)	4.106	0.776
t-stat		3.28**	3.45**
$EA\_D * UE$	(+)	1.556	0.409
t-stat		2.54**	2.05*
$ACC/FIN$	(+)	1.986	0.410
t-stat		1.63	1.89*
$LEG/REG$	(+)	-1.707	0.574
t-stat		-0.76	1.40
$OPER$	(+)	0.678	0.442
t-stat		0.48	1.75*
Adjusted $R^2$		0.06	0.06
# of Obs		368	368

\*\* and \* denote significance at the 1% and 5% levels, respectively (a one-tailed test statistic when a prediction on the sign is made and a two-tailed test statistic otherwise).  $ICM$  is the set of information content dependent variables  $\{URV, UTV\}$ . All other variables are as defined in Appendix 1. The observations winsorized in Table 5 remain winsorized in this sub-sample.

NOTE: This model is estimated on a sample of 368 firms: 184 from the material weakness sample receiving an adverse opinion subsequent to their initial material weakness disclosure, along with the corresponding 184 matched firms from the control sample.

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