

## Abstract

This paper examines the economic relevance of the factors set forth under Section 408 of the Sarbanes-Oxley Act to guide the enhanced regulatory scrutiny of public company financial disclosures, as required under the Act. We interpret two of the factors, volatility and firm size, as predictors of a public company's relative risk of non-compliance or the prospective loss to investors, conditional upon non-compliance. We use disclosures of material weaknesses in internal controls under Section 404 as indicators of the potential for non-compliance. Our evidence is that the Section 408 factors that we associate with a relatively high risk of non-compliance – high stock-price volatility, and whether a company is emerging with a disparate PE ratio – are good predictors of reported material weaknesses in internal controls. In addition, while Section 408 calls for enhanced review of large firms – those with high market capitalization and a material affect on the economy – we find that relatively few large firms have disclosed material weaknesses in internal controls. The large firms that have disclosed material weaknesses, however, comprise 92% of the market capitalization of all companies disclosing a material weakness. In contrast with the focus of the public debate on the compliance problems of smaller public companies, our evidence points to high volatility as a stronger predictor of compliance problems under the Act than small firm size. Finally, we discuss alternate explanations for our findings and the potential for unintended consequences for shareholders.

## **Regulatory Monitoring Under Sarbanes-Oxley: The Intersection of Sections 408 and 404 of the Act**

### I. INTRODUCTION

The Sarbanes-Oxley Act of 2002 has received a great deal of attention both in the media and in the academic literature. The Act was signed into law during a period of concern about abuses of management discretion and the possible erosion of investor confidence. Several of the reforms under the Act can be seen as altering the internal governance of corporations in a way that limits management discretion and improves incentives to produce timely and accurate financial reports.

This paper examines the Sarbanes-Oxley Act from the unique perspective of testing its internal consistency. We compare two distinct features of the Act, each of which may directly or indirectly improve the *internal governance* of public companies. Section 408 of the Act identifies factors for the SEC staff, and thus potentially other regulators, to use as indicators of prospective problems in company financial reporting. Section 404 requires that companies publicly disclose “material weaknesses” in their internal controls over financial reporting.<sup>1</sup> Financial reporting practices, after the passage of the Act, receive more routine scrutiny from outsiders – regulators in the case of Section 408, and auditors and investors in the case of Section 404.<sup>2</sup> The indirect effect is to strengthen managers’ incentives to improve internal governance,

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<sup>1</sup> A number of recent papers have discussed the material weaknesses in internal controls as indications of the quality of financial reporting. Opponents of Section 404, however, have questioned the ability of internal controls to increase the quality of financial reporting information (see Cunningham (2003) and Langevoort (2005)).

<sup>2</sup> In his testimony before the Senate Committee on Banking, Housing and Urban Affairs on September 9, 2003, Chairman Donaldson noted that “with the addition of a substantial number of accountants to our Division of Corporation Finance” the SEC will increase its focus on the annual review of 33% of all public companies as well as its focus on the largest companies and “other companies where review is most important.” At the time of his testimony, Congress budgeted the SEC an additional \$218 million (a 63% increase over the previous year’s appropriation) of which a portion was to be used to hire an additional 842 new staff.

particularly internal controls over financial reporting, in order to reduce the risk of harm from problems in financial reporting.

We use evidence on reports using of disclosures of material weaknesses under Section 404 from the fiscal year end of 2004 to test the predictive power of the “review criteria” set forth in Section 408. The analysis in this paper takes a perspective consistent with the views of those who might find Sections 408 and Section 404 beneficial to investors, independently of issues relating to cost, which we do not address here. In doing so, we examine the internal consistency of the two sections of the Act and test the practical usefulness of the Section 408 factors as indicators of company-specific risk and potential harm to investors from false financial reporting.<sup>3</sup>

We distinguish between two types of Section 408 factors, volatility and firm size, according to whether they suggest a higher *risk* of non-compliance (volatility) or a greater *potential harm* to investors from non-compliance (firm size), conditional on its occurrence.<sup>4</sup> More timely detection can improve management’s incentives by lessening the expected gain to management from falsification (or obfuscation) of financial reports and by increasing the expected sanction borne by management from such actions. An effective regulatory monitoring program will typically take both types of factors into account.

Of these factors, our evidence is that high volatility is a good predictor of reports of material weakness under Section 404. Large size is not a good predictor of non-compliance risk despite its designation under Section 408. Closer inspection of the data, however, reveals that large companies disclosing material weaknesses under Section 404 account for a relatively large

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<sup>3</sup> Note that the criteria actually applied in scheduling reviews under Section 408 remains proprietary to the staff of the Division of Corporate Finance of the SEC staff. The measurement variables for the Section 408 factors used in this paper do not purport to be the same as those considered by the SEC staff.

<sup>4</sup> We use the term non-compliance to refer to a possible misalignment with the principles associated with the Act and other securities regulations, see for example Chhaochharia and Grinstein (2007).

share of the market capitalization (92%) of all companies disclosing material weaknesses and 8.6% of the market capitalization of all publicly traded companies. Further, the average market capitalization of large firms disclosing material weaknesses in internal controls is 11 times greater than for small firms disclosing material weaknesses.<sup>5</sup>

From the perspective of the extensive public debate about Section 404 implementation, our evidence on the important role of volatility as a predictor of compliance problems is surprising. In that debate, the key determinant of compliance problems under Section 404 is the size of the reporting company.<sup>6</sup> Among the Section 408 factors, we find that volatility, not size, is the factor most closely related to compliance problems among the Section 408 factors.

Langevoort (2005) argues that weak internal control environments increase the potential for management to exercise discretion in the dissemination of information and hence, financial misreporting.<sup>7</sup> In addition, we interpreted stock-price volatility as an indicator of risk of non-compliance. These interpretations of the empirical evidence have some support in the previous literature.<sup>8</sup> For example, Demsetz and Lehn (1985) and Demsetz (1983) argue that the gain to investors from monitoring<sup>9</sup> and controlling (or influencing) management is increasing in the

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<sup>5</sup>Our paper differs in focus from prior literature on the determinants of material weaknesses in internal controls, for example Doyle, Ge and McVay (2007) and Ashbaugh-Skaife, Collins and Kinney (2005). Since the factors to be considered for company review under Section 408 are prescribed by law, we are interested in whether Congress applied sound economic reasoning in its choice of review criteria. We recognize that including other firm characteristics as identified by the aforementioned authors may increase the chance of detection over and above the Section 408 review factors. However, such firm characteristics are not mandated for use in review under the Sarbanes-Oxley Act.

<sup>6</sup> While this discourse has tended to focus on companies with public float of less than \$75 million (“non-accelerated filers”), the issue of scale economies may exist even among the smaller companies that we study.

<sup>7</sup> As Langevoort (2005) points out “Managers no doubt want some opacity within their sphere of activities to conceal risky or opportunistic behavior, so strong internal controls are a threat.” Volatility, in this context, reflects the ability of the manager to exercise discretion, both beneficial and harmful as well as the potential threat of detection. This latter view highlights a possible unintended – and potentially offsetting – cost of mandating improvements to internal governance, which we consider briefly in Section VII.

<sup>8</sup> See West (1988), Simon (1989), Farrell (2003), Moeller, Schlingemann and Stulz (2006) to name a few.

<sup>9</sup> While we use the term, “monitoring,” as it appears in the agency literature dating back to the widely cited work of Jensen and Meckling (1976), it is important to recognize that the term has a different meaning in the context of SEC staff reviews of financial reports. In that context, “monitoring” and “review” refer to different levels of staff scrutiny. Our discussion of Section 408 will focus on the “review” activity of the staff. “Monitoring” in this paper

level of firm-specific stock price volatility. Adams, Almeida and Ferreira (2003) find that in industries in which there is a high degree of managerial discretion, CEO influence is positively associated with stock return variability. Public disclosures of material weakness under Section 404 are also linked in the literature to adverse stock-price movements among reporting companies. (See Cheng, Ho and Tian (2005), Beneish, et al (2005), Bryan and Lilien (2005), and De Franco et al (2005)).

There are, however, other interpretations of volatility which may lead to the possible unintended consequences of the sections of the Act that we study here. While the potential for managerial abuse may be greater for high volatility companies and thus warrant additional scrutiny, the imposition of a system of internal controls may hinder the efficiency of managers to act quickly in highly volatile environments. Thus, while the goal of Section 404 may be to limit shareholder welfare reducing behavior by managers, there is the possibility of the unintended consequence of reducing the competitiveness of the firm.

The remainder of the paper is organized as follows. A discussion of potential variables as measures of the Section 408 factors and our hypotheses is in Section II. A review of the literature is presented in Section III. Section IV provides an overview of the data and descriptive statistics, while Section V presents evidence on the risk of non-compliance, while Section VI presents evidence on the potential harm from non-compliance. Section VII discusses alternative interpretations of the findings and finally, the paper concludes in Section VII.

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will refer to activities that diminish the agency costs of separation of ownership and control in the sense of Jensen and Meckling.

## II. POTENTIAL MEASURES OF 408 FACTORS AND HYPOTHESES

Section 408 (see Appendix 1) identifies five factors for consideration by the SEC staff in scheduling the reviews of financial reports filed by public companies. These factors provide a distinct perspective on the relative benefits of the regulatory review of financial reports. We examine four of these factors, those that rely on the use of financial market data, as an indication of how best to allocate scarce resources in the review of financial reports.<sup>10</sup> We regard the first two factors as indicators of the company's *risk of non-compliance*:

- significant volatility and
- emerging companies with disparate market price to book value

The second two factors indicate the potential *harm from non-compliance*:

- large market capitalization and
- significant affect on a material sector of the economy

The first two factors associated with the risk of non-compliance are consistent with view of Section 408 which suggests closer regulatory review of companies in which there is greater investor uncertainty and scope for management discretion over financial reporting. Outside investors in companies that are recently public and have disparate PEs relative to their peers have less information about those companies, in part because, potentially, they have more intangible assets.<sup>11</sup> We hypothesize that the higher cost of monitoring by outsiders of these types of companies places external market monitoring at a comparative disadvantage to regulatory monitoring (Hermalin and Weisbach (2006)).<sup>12</sup> Therefore, we hypothesize that companies that

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<sup>10</sup> The presence of a material restatement, which is a fifth review criterion in Section 408, is included in the dependent variable in our empirical analysis of alternative predictors of disclosures of material weaknesses.

<sup>11</sup> Recent research by Wei and Zhang (2006) on the increase in volatility of individual stocks finds that newly listed stocks accounted for much of the increase.

<sup>12</sup> Also see Demsetz (1983), Demsetz and Lehn (1986), and Holderness, Kroszner and Sheehan (1999) for theory and evidence on the relation between stock-price volatility as a measure of the cost to outside investors of

have high volatility and companies that are emerging with disparate PEs each tend more frequently to report material weaknesses in internal controls than other companies.

The remaining two factors associated with the potential harm from non-compliance capture the relative size and influence of the company. The reforms associated with the Sarbanes-Oxley Act may be seen as a response to the demand for more intensive scrutiny of larger and more influential public companies. While the potential risk of non-compliance may be low for larger, more established companies, the potential investor harm should non-compliance occur may be significantly large to warrant additional scrutiny. We thus hypothesize that large companies, defined as those with large market capitalizations or companies that significantly affect a material sector of the economy, are more likely, when disclosing a weakness in internal controls, to have significantly greater investor capital at risk.

### III. RELATED LITERATURE

Although this is the first paper to present direct empirical evidence related to the factors mentioned in Section 408, these factors have received a great deal of attention in the previous literature. In drawing upon that research, we propose an economic interpretation of the Section 408 factors that we believe is most consistent with the objective of the reforms under the Sarbanes-Oxley Act.<sup>13</sup> As such, we follow in the tradition of using volatility as a measure of the scope for managers to exercise discretion and, thus, the potential for moral hazard in public companies. Demsetz and Lehn (1985) argue that firms in stable environments have low costs of monitoring and managerial contracting. “Frequent changes in relative prices, technology, and

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monitoring the corporation and holding its managers accountable for their actions in relation to the holdings of concentrated equity stakes by top managements, which requires the costly bearing of undiversifiable risk. Kole and Lehn (1999) provide further discussion of regulatory monitoring and costly internal governance mechanisms as substitutes in the production of an alignment between management actions and the investor interest.

<sup>13</sup> We consider alternative interpretations of the role of volatility in Section VII.

market shares require timely managerial decisions concerning redeployment of corporate assets and personnel” (p. 1159). In this view, the relative noisiness of a firm’s environment can inhibit monitoring by outsiders and thereby affect the choice of governance, resulting – as considered here – in greater reliance on regulatory rules and monitoring to achieve externally verifiable improvements to internal governance.

More recently, Adams, Almeida and Ferreira (2003) examine the potential for the exercise of managerial discretion to affect stock price volatility, using an indicator of CEO power and scope for managerial influence. They find that when power is concentrated in the hands of the CEO, the variability in share price returns is greater. In addition, highly concentrated power in the hands of the CEO leads to both the best and the worst returns. These findings can be interpreted as evidence on the impact of managerial discretion and its two-sided nature.

Further, stock price volatility is indeed a key part of the evidence cited in financial economics research into the informational consequences of the onset of mandatory disclosure rules under the 1934 Exchange Act. Benston (1973, 1975), Stigler (1964), Simon (1989) and Farrell (2003))<sup>14</sup> find that volatility declines after the passage of regulation increasing mandatory disclosure

Our empirical analysis is guided by the view that external market discipline is a substitute for the discipline that auditors and regulators may place on corporate managers and their designated financial and accounting officers. In this view, the volatility of the company is assumed to be associated with the ease with which external market participants can observe and

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<sup>14</sup> Simon (1989) concludes that the 1934 Act improved the quality of information impounded into security prices for some, if not all, securities traded at the time. Specifically, unseasoned, non-NYSE securities exhibited lower stock-price volatility after the Act than before – consistent with the view that investors had relatively little information about those securities before the regulation, so that the onset of regulation had a greater effect on those issues than on other issues. More recently, Ferrell (2003) presents evidence of a dramatic decline in OTC stock-price volatility around the 1964 imposition of mandated disclosure requirements on the OTC market, interpreting this as evidence of information reaching the market more rapidly than before.

evaluate the implications of insider's actions for investor value. Highly volatile companies are thus regarded as the least susceptible to the external disciplines of the market and more likely to have greater managerial discretion in financial reporting.

The academic literature also indicates that monitoring on the basis of volatility may, in fact, be equivalent to monitoring on firm size. That is, volatility tends to be highly correlated and inversely related to firm size. A number of papers have found a correlation between increased volatility, the age of the firm and the size of the firm.<sup>15</sup> The inclusion of both volatility and size among the Section 408 factors suggests the exercise of caution when interpreting previous findings in the Section 404 academic research that relates firm size to a higher incidence of material weaknesses in internal controls. One additional contribution of this research is to empirically examine the relation between size and volatility in predicting material weaknesses in internal controls and hence, the possibility of inadequate financial reports.

The subject of Section 404 implementation has received extensive attention from the academic literature despite only being applied to accelerated filers for fiscal years ending after November 15, 2004. This growing body of literature has examined the determinants and effect of disclosures of material weaknesses in internal controls. Bryan and Lilien (2005) examine 161 firms that report a material weakness and find that these firms are smaller and have lower betas than their industry matched counterparts. In an examination of firms with internal control deficiencies prior to the implementation of Section 404, Ashbaugh-Skaife, Collins and Kinney (2007) find that firms disclosing inadequacies in internal controls are more complex, smaller in size and have higher growth. Doyle, Ge and McVay (2005) examine 779 firms that report at

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<sup>15</sup> See Campbell et al. (2001), Pastor and Veronesi (2003), Wei and Zhang (2006), and Core and Guay (2002) for example.

least one material weakness from August 2002 to August 2005. They find that firms reporting material weaknesses are smaller, younger, financially weaker and more complex

A number of papers have examined the market's reaction to a disclosure of a weakness in internal controls. Uniformly, these papers find that the market reacts negatively to the disclosure. Cheng, Ho and Tian (2005), for a sample of 259 companies, find a -2.25% CAR around the disclosure date. The reaction is negatively related to CAR if the material weakness leads to a restatement and/or the company states it cannot fix the weakness by year-end. The CAR is positively related to business complexity and whether or not the company has foreign operations. Beneish et al. (2005), Bryan and Lilien (2005), De Franco, Guan and Lu (2005) and Hammersley et al. (2005) also report negative CARs upon announcement of material weakness or internal control deficiency.

Contemporaneous to this research, Ashbaugh-Skaife, Collings, Kinney and LaFond (2006) also examine volatility and internal controls but interpret their findings differently from those presented here. They argue that volatility is greater for firms disclosing an internal control deficiency because of "market participants' assessment of non-diversifiable risk (beta), idiosyncratic risk and cost of equity capital incorporate expectations about internal control risks based on observable characteristics." Under this interpretation, the *expectation* of internal control problems drives volatility prior to any announcement of an actual internal deficiency. In contrast, we argue that volatility in the pre-announcement period is driven by factors other than expectations regarding effective internal controls. In this respect, volatility is taken as a fundamental characteristic of the firm that incorporates the underlying nature of the business environment which may affect compliance with Section 404.

Overall, the recent academic research on internal control disclosures indicate that the information contained in Section 404 audits is valuable to the market. Further, many of these papers conclude that this information is related to the perceived quality of financial reporting. Firms with material weaknesses in internal controls are perceived to have lower quality financial reporting than firms with effective internal controls. Thus, using the outcome of Section 404 audits may be useful in determining whether the factors identified in Section 408 provide a useful guide for regulatory monitoring.

#### IV. DATA AND DESCRIPTIVE STATISTICS

Our initial sample of 3,827 firms reporting on internal controls was compiled using data from *Audit Analytics*. *Audit Analytics* compiles disclosures of effective internal controls under Section 404 for the fiscal year end 10-K filing and our sample encompasses fiscal years ending between 12/31/04 and 10/31/05.<sup>16</sup> Table 1 presents the sample construction. After eliminating firms that had double entries for the same fiscal year, those missing a GVKEY and CIK match and firms missing market capitalization and revenue, the final sample includes 3,344 companies.<sup>17</sup> Of these companies, 15% or 503 companies report a material weakness in internal controls. We examine the following Section 408 monitoring metrics: volatility, emerging companies with disparate PE, companies with the largest market capitalization, and companies that affect a material sector of the economy.

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<sup>16</sup> Note that as of this writing, only accelerated filers as defined as registrants with \$75 million or more in public float are required to attest to their internal controls.

<sup>17</sup> Some companies have double entries because they file an amended 10K for the same fiscal year. If the effectiveness of internal controls conflicts (i.e. the first 10K, for example, states controls are effective and the amended states they are not), we used the 10K which stated that internal controls are ineffective. In no case did an amended 10K state that internal controls were effective when a prior 10K stated they were not.

Appendix 2 presents the name of each Section 408 factor and our empirical definition. In each instance, we are interested in whether there is a relation between the factor and the potential for inadequacies in financial reporting as revealed by disclosures of material weaknesses in internal controls. Our measures of Section 408 factors are designed to evaluate the potential risk or harm from non-compliance of the company *prior* to the date of the Section 404 audit on internal controls.

We generate our measures of Section 408 factors using data obtained from the year prior to the end of the fiscal year of the Section 404 audit in *Audit Analytics*. In order to construct our measures of volatility, we obtain data on the daily value-weighted market index and each individual firm's returns from CRSP. Our measure of volatility includes idiosyncratic risk following previous academic literature. The measure of idiosyncratic risk is the standard error term from the standard market model,  $\sigma_\epsilon$ . The market model is estimated using daily data from one year prior to the fiscal year end to 12 months prior to the fiscal year end.<sup>18</sup> "High volatility" companies are companies whose volatility is above the median.

Measures of whether a company in our data is considered an "emerging company with a disparate PE ratio" in the year prior to the Section 404 audit are generated using data on the inception date on CRSP as the age of the firm and PE ratios from Compustat.<sup>19</sup> In order to define emerging companies with disparate PE, we first define an emerging company as a

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<sup>18</sup> We used alternative lags of all of the variables: from -6 months to -12 months and -18 to -30 months. Our results are robust to these alternative lags as well as different measures of volatility such as total stock price volatility and idiosyncratic volatility adjusted for the average industry idiosyncratic volatility.

<sup>19</sup> Data on EPS, share price, shares outstanding, revenue and assets at the end of the second quarter is obtained from Compustat. We adjusted Compustat's fiscal year to line up with Audit Analytics fiscal year end. The adjustment is only for firms whose fiscal year end in Audit Analytics is between January 1 and June 30. Compustat assumes that fiscal year ends fall between July 1 and June 30. Therefore, we subtract one from the fiscal year end date in Audit Analytics if the fiscal year end is between January 1 and June 30 to get the Compustat fiscal year.

company whose age is in the bottom quartile of all firms' age.<sup>20</sup> Next, Disparate PE Ratio is defined as the bottom quartile of the EPS/Price ratio. We use the EPS/Price ratio instead of the traditional PE ratio because many of the firms in our sample have zero EPS. In order to be defined as an Emerging Company with a Disparate PE Ratio, both the firm's age *and* the firm's Disparate PE Ratio must be in the lower quartile.

Large companies are defined as companies whose market capitalization is above the median of the full sample's market capitalization. Market capitalization is calculated one year prior to the fiscal year end using data from Compustat. Companies that significantly affect a material sector of the economy are defined as follows: First, a sector is defined using two-digit SIC industry classifications. Next, each company's proportion of their respective industry revenue is calculated. Then each company is ranked by its proportion of industry revenue. Companies whose proportion of industry revenue falls in the upper quartile of all company's share of their respective industry is defined as a company whose operations significantly affect a material sector of the economy.

In addition to our measures of Section 408 factors, we collect data on assets and revenue from Compustat and whether or not the firm employed a Big 4 Auditor. Assets and revenue are used as a basis for the size comparison later in the paper. A large body of literature has examined the relation between size of the company and the presence of a Big 4 auditor.<sup>21</sup> Therefore, we also include the presence of a Big 4 Auditor to control for the interaction between firm size and auditor choice.

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<sup>20</sup> We are aware that many older firms will have an inception date equal to the beginning date of data quoted in CRSP (1962).

<sup>21</sup> See for example Francis and Stokes (1982), Palmrose (1986a), Francis and Simon (1987), Craswell, Francis and Taylor (1995), Boo and Koh (2004) and Chaney, Jeter and Shivakumar (2005).

Table 2 presents descriptive statistics on the above variables for our full sample of public companies that disclosed the outcome of their Section 404 audit in *Audit Analytics*. The mean market capitalization is \$3.8 billion with a median of \$645 million.<sup>22</sup> These companies have been publicly traded for an average of 16 years. The mean revenue is \$737 million and the mean assets are \$7.4 billion. The medians for both variables are substantially smaller, reflecting skewness in the data.

The correlation among variables is presented in Table 3. Correlations among almost all the variables are statistically significant. Volatility is negatively associated with age and firm size while market capitalization is positively correlated with age.

## V. RISK OF NON-COMPLIANCE

### A. Univariate Statistics

In this section, we present univariate statistics on differences in means between our measures of Section 408 factors – or, more accurately, suggested review criteria under Section 408. For each factor that we propose is a measure of either the risk or potential harm from non-compliance, we compare differences in the percentage of firms that have disclosed a material weakness in internal controls.<sup>23</sup>

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<sup>22</sup> The vast majority of publicly traded companies are considered small or less than \$700 million. According to statistics provided to the Advisory Committee on Smaller Public Companies, almost 75% of all publicly traded companies have a market capitalization less than \$700 million. [http://www.sec.gov/info/smallbus/acspc/acspc-finalreport\\_d.pdf](http://www.sec.gov/info/smallbus/acspc/acspc-finalreport_d.pdf) It is interesting to note that the median size of the company falls within the definition of a smaller public company as defined by the Advisory Committee.

<sup>23</sup> We are interested in the potential for internal control audits to provide information about accounting difficulties that is superior to what has been available from other sources, such as from statistics on corporate misconduct. Unlike corporate misconduct statistics that depend on the exercise of sufficient enforcement discretion to generate a formal legal or regulatory action, most companies over a certain size threshold are required to have auditor attestation as to the quality of their internal controls. Cunningham (2003), however, argues that internal controls may not be as effective in preventing instances of corporate malfeasance because of their inherent design problems. As such, we are not arguing that Section 404 is a replacement for mandated monitoring under Section 408 because other types of corporate misconduct or disclosure that internal controls may not capture may be the target of SEC staff review or monitoring.

The Section 408 measures that we consider to be related to the risk of non-compliance are firm specific volatility and an emerging company with a disparate PE ratio. The Section 408 factors for measures that capture the potential harm from non-compliance are market capitalization and any company with a significant affect on a material sector of the economy. Our initial tests concentrate on whether the factors associated with a greater risk of non-compliance results in more frequent disclosures of material weaknesses in internal controls.

In Table 4, the Section 408 factors hypothesized to be associated with a higher risk of non-compliance, greater than median volatility and emerging companies with disparate PE ratios, have significantly greater disclosures of material weaknesses than do their low risk counterparts. For the high volatility factor, the proportion of companies with a material weakness in internal controls is approximately 21% compared to only 9% with firms in the low volatility category. The difference in means for both of the volatility measures is significantly positive indicating that firms with greater non-compliance risk are more likely to have material weaknesses.

Companies that are emerging and have disparate PEs also are more likely to have material weaknesses than other companies. The companies as defined by this variable have a material weakness almost 26% of the time as compared to only 14% for companies that are not defined as emerging with disparate PEs. Again, this difference is statistically significant.

Table 4 also indicates that companies with the potential for a having a high potential harm from non-compliance, as evidenced by companies with greater than median market capitalization and an affect on the material sector of the economy are less likely to disclose a material weakness in internal controls. These larger firms are half as likely to disclose a material weakness in internal controls as their smaller firm counterparts and thus, have lower risk of non-

compliance.<sup>24</sup> However, these findings indicate smaller firms have an increased potential for non-compliance risk and this source of risk is not specifically mentioned in Section 408. Thus, the univariate statistics in Table 4 indicate that monitoring on the basis of volatility may, in fact, be equivalent to monitoring on firm size. That is, volatility tends to be highly correlated and inversely related to firm size. This has been noted in the previous academic literature (see Campbell, et al. (2001), Pastor and Veronesi (2003), and Wei and Zhang (2006)). Therefore, the inclusion of both volatility and small firm size as potential non-compliance risk factors suggests the exercise of caution when interpreting previous findings in the Section 404 academic research that relates firm size to a higher incidence of material weaknesses in internal controls. Therefore, we empirically examine the relation between size and volatility in predicting material weaknesses in internal controls and hence, the possibility of inadequate financial reports.

#### *B. Relation Between Size and Volatility*

The well-known empirical fact that volatility and firm size are inversely correlated leads us to examine more closely the evidence on whether monitoring on the basis of size may be equivalent to monitoring on the basis of the level of volatility. Table 5 presents statistics conditional on both firm size and volatility.

In this table, companies are first categorized by their market capitalization as either large companies (above the median market capitalization) or small companies (below the median market capitalization). Panels A (Large Companies) and B (Small Companies) compare differences between high volatility (above the median volatility) and low volatility (below the median volatility) companies for each size category.

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<sup>24</sup> The finding that larger companies are less likely to have a material weakness in internal controls has been confirmed in a number of papers, for example, Asbaugh-Skaife, et. al (2005) and Doyle, et.al. (2005).

Panel A examines the difference between high and low volatility companies that are classified as large in terms of market capitalization. Within the large company category, volatility still provides separation in the probability of a material weakness in internal controls. Large companies with high volatility have more than double the percentage of companies with material weaknesses (16% compared to 7%). However, high-volatility large companies are still substantially smaller than their low-volatility large company counterparts. The average market capitalization for a large company with high volatility is \$2.7 billion compared to \$9.5 billion for a large company with low volatility. Large companies with high volatility are younger and have lower revenue and fewer assets than large companies with low volatility. There is no difference in auditor choice by volatility for large companies. Therefore, the relation between size and volatility appears to persist even after controlling for size.

Panel B presents statistics on small companies by high and low volatility. There is still a statistical difference in the percentage of companies reporting a material weakness in internal controls for small companies with high volatility and small companies with low volatilities. Small companies with high volatility have 23% of the companies disclosing a material weakness compared to 15% of small companies with low volatility. Although market capitalization is significantly different between the two samples, the economic difference appears quite small. Both assets and revenues are smaller for small companies that have high volatility. In our data, Big 4 auditors are found to audit small companies with high volatility more frequently than small companies with low volatility.<sup>25</sup>

The univariate findings alone are unable to separate the effects of volatility and size on the probability of a disclosure of material weakness. Therefore, to further examine the relation

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<sup>25</sup> One must be careful in interpreting this as meaning that the lack of a Big 4 auditor results in more disclosures of a material weakness. As noted before, there is an extensive literature regarding the endogeneity of auditor choice.

between size and volatility further, we divide market capitalization into ten deciles and volatility into quartiles in Table 6. We then assign each company into a size/volatility bin and calculate the percentage of companies in each bin that disclose a material weakness. Next, each bin is compared to the total sample percent of firms disclosing a material weakness (15.8%). If the percent of material weaknesses disclosed in any bin is statistically higher or lower than the average for the entire sample, that bin is then shaded. Statistical significance (+ indicating greater, - indicating smaller) is also noted.

The table illustrates the relation between size and volatility in the frequency of disclosures of material weaknesses. Greater than average disclosures of material weaknesses are more likely to occur at high levels of volatility rather than small size. For the lowest category of volatility, the greatest frequency of disclosures of material weaknesses occurs among mid-sized companies rather than the smallest companies. For the highest volatility quartile, all but the largest market-capitalization decile (with only 3 companies) have high frequencies of material weaknesses.

When market capitalization is held constant, there is a stronger relationship between greater volatility and higher frequencies of disclosures in material weaknesses. As volatility increases, holding size constant, the proportion of firms disclosing a material weakness in internal controls increases. Companies with the lowest frequency of material weakness disclosures are large, low volatility companies. Therefore, we conclude that volatility and size are not perfect substitutes in predicting whether a company will be found to have a material weakness in its internal controls

### *C. Multivariate Analysis*

Using a multivariate probit analysis, we examine the robustness of the findings from the univariate analysis to controls for industry and other factors that may also affect whether a company discloses a material weakness. The dependent variable is a dummy variable =1 if the firm discloses a material weakness in *Audit Analytics* and a dummy variable=0 if the firm does not disclose a material weakness in the data. The independent factors are measures of the Section 408 factors, the presence of a Big 4 Auditor and two digit SIC industry dummies. Consistent with the univariate analysis, both of our measures of Section 408 factors that are measures of the risk of non-compliance are good predictors of Section 404 material weaknesses even after controlling for auditor and industry variables.

Table 7 presents key findings from the multivariate analysis of the occurrence of material weakness disclosures. We use a probit model. For Models 1 through 6, both volatility and market capitalization are useful in predicting the occurrence of a disclosure in material weaknesses. High volatility and low market capitalization are associated with an increased frequency of a material weakness disclosure. The negative relation between size and material weakness reports persists after including volatility and other factors. Despite the status of large size as a Section 408 factor, large market capitalization is found to be negatively – not positively – related to the disclosure of material weakness.

Research by Pastor and Veronesi (2003) and Wei and Zhang (2006) document that the recently observed increase in volatility of individual stocks is primarily driven by newly listed companies. Consistent with this research, we find that an emerging company with a disparate PE has predictive power over and above size and volatility.

Whether or not a company has a significant affect on a material sector of the economy is unrelated to the probability of a material weakness in internal controls and may be due to the high level of correlation between this variable and market capitalization. After controlling for other factors, the presence of a Big 4 auditor is found to be negatively related to whether a company discloses an internal control weakness. We include industry dummies to take into account the varying levels of volatility and size across industries. The inclusion or exclusion of these industry dummies does not change the significance levels of the coefficients on our Section 408 factors.

In order to further examine the dual roles of size and volatility, we rerun the probit analysis by splitting the sample into large companies (market capitalization above the median) and small companies (market capitalization below the median). Volatility is still the dominant factor in predicting the occurrence of a material weakness in internal controls. Now, however, market capitalization is unrelated to material weakness disclosures. For both large and small companies, the size of the company has very little explanatory power. The Big 4 Auditor effect remains present but is stronger for smaller companies. As the univariate results indicate, large companies are almost always audited by a Big 4 Auditor. Therefore, it is not surprising that the Big 4 Auditor effect is predominately in the smaller companies.<sup>26</sup>

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<sup>26</sup> We further examine the robustness of our results to by excluding any confounding disclosure of a prior internal control deficiency (ICD which may or may not rise to the level of a material weakness) in both the sample of firms disclosing a material weakness and the control sample. For the sample of firms disclosing a material weakness there are 166 firms that had a prior ICD and for the control sample, 139 firms had a prior ICD that either was subsequently remediated or did not rise to the level of a material weakness. Our findings are robust to the exclusion of these firms. Interestingly, there is no significant difference in the volatility between firms currently disclosing a material weakness and those firms that had a prior ICD but did not disclose a material weakness in our sample despite the fact that firms currently disclose a material weakness are substantially smaller. This preliminary result suggests that it may not be the anticipation of a material weakness that drives volatility as suggested by Ashbaugh-Skaife et al. (2006).

## VI. POTENTIAL FOR HARM FROM NON-COMPLIANCE

The preceding section presented evidence of a positive relation between factors in Section 408 that we associate with risk of non-compliance and disclosures of material weaknesses. However, Section 408 also calls for regulatory review of companies that appear to have a low risk of non-compliance but the potential for a large loss of market capitalization around the news of a financial reporting problem. The dramatic change in market capitalization that can occur around such news is most evident after the scandals of Enron and Worldcom where significant investor and stakeholder value was eradicated.<sup>27</sup>

Table 8 examines the potential investor capital at risk, as proxied by market capitalization, for companies that disclose a material weakness.<sup>28</sup> Panel A presents statistics for the entire sample of companies. Consistent with the prior results, smaller companies are twice as likely, *ex ante*, to disclose a material weakness in internal controls but the amount of investor value at risk is significantly smaller. For smaller companies, less than 1% of all market capitalization was potentially affected by the disclosure of a material weakness compared to almost 8% of total market capitalization for larger companies.<sup>29</sup>

Panel B presents the *ex post* potential economic harm for only the sample of companies that did disclose a material weakness in internal controls. Although small companies are much more likely to disclose a material weakness, large companies disclosing a material weakness

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<sup>27</sup> We do not here distinguish between real harm and the loss of market capitalization that may occur around the news of a false financial report. Difficulties in distinguishing the two can arise where the news of a false report includes bad news about the value of future cash flows that would eventually have reached the market, independently of any problems in financial reporting.

<sup>28</sup> This is an upper bound estimate in the sense of including all equity capital of the reporting company. We recognize that the actual market impact may not be constant across firm size and that the vast majority of market capitalization is unlikely to be at risk should an accounting irregularity arise.

<sup>29</sup> This evidence on the cumulative market capitalization of companies that have reported material weaknesses is distinct from evidence on the stock-price movements that occur around news of a material weakness. A number of studies have examined the market response to reports of material weakness, as explained previously. These reports are accompanied by other disclosures, which can make it difficult in those studies to obtain a clean estimate of the market impact (see Hammersly, Myers and Shakespeare (2005)).

have 11 times the amount of market capitalization at risk than small companies. In other words, small companies that disclose a material weakness are only 1/20 the size of the large companies disclosing a material weakness. The market capitalization of large companies disclosing a material weakness consists of almost 92% of the total market capitalization of all companies disclosing a material weakness. The findings of this section suggest that the Section 408 factors that measure the potential economic harm do in fact capture a significant amount of the investor capital at risk.

## VII. ALTERNATE INTERPRETATIONS

The preceding discussion has presented evidence that the criteria in Section 408 appropriately identify companies with either a high probability of non-compliance or the potential for greater harm to investors should non-compliance occur. We have used the disclosure of a material weakness in a company's internal controls under Section 404 as an indicator of the potential for non-compliance to be reviewed and monitored under Section 408.<sup>30</sup> While the empirical results suggest that Section 408 factors are useful in predicting problems in financial reporting as indicated by reports of material weaknesses under Section 404, there are a number of alternate interpretations.

The improvement of the internal governance of companies with high volatility is consistent with a regulatory strategy of reducing the expected harm from non-compliance by

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<sup>30</sup>Examining the outcome from the initial implementation of Section 404 appears most useful for the present purpose of evaluating compliance risk in relation to the 408 factors because companies with high compliance risk would have had less time to adapt to the new regulatory regime at the time of the initial implementation than subsequently. Disclosures of material weaknesses would then present researchers with the greatest opportunity for distinguishing the companies with the high and low risks of non-compliance from the perspective of the drafters of the Act at its time of passage. The ability to separate among the two types of companies may decline over time, as the relatively high-risk companies adapt to the new regulatory regime and as the cost of adapting declines through learning and the emergence of network economies.

imposing greater internal monitoring where the actions of managers are less observable. If volatility, however, is partially determined exogenously, this reduction in adverse managerial action may come at a cost in the ability of the manager to respond quickly to changes in the underlying business environment. The requirement that companies' financial reporting processes be tracked by systems of internal controls could cause changes in management behavior that may outweigh the improvement in financial reporting. For example, managers may be affected by the prospect of heightened internal monitoring with a potential loss in strategic flexibility which, in turn, could affect the ability of the firm to compete with rivals not subject to the regulation. Thus, the potential benefit of limiting welfare-reducing actions by managers through greater monitoring could have the unintended consequence of reducing shareholder welfare, nonetheless. Although Hermalin and Weisbach (2007) focus on career concerns of the CEO, their central premise – that mandated changes in corporate governance can lead to shifts in managerial behavior – is consistent with this conjecture.

Mandated corporate governance can more generally reduce the harm from “bad” managerial discretion at the expense of “good” managerial discretion. An emerging literature examines the various mechanisms through which such trade-offs may occur. For example, Coles, Daniel and Naveen (2005) find that in R&D intensive firms, Tobin's Q increases with the fraction of insiders on the board. This logic is similar to the argument presented above in that the positive aspects of managerial action and the ability of the manager to respond quickly to changes in the competitive environment is enhanced when there are fewer frictions in the decision-making process.

Adams, Almeida and Ferreira (2003) more directly examine the conditions under which mandated corporate governance, whether internal or external may have the unintended

consequence of limiting “good” managerial discretion. Consistent with our findings, they document that firms with greater CEO influence also tend to have higher volatility. As evidence of the potential cost of mandating corporate governance structures, they conclude “our results point out one potential cost of diluting CEO power: although performance will be less variable, the probability of spectacular performance will be lower.”

To the extent that corporate governance prior to Sarbanes-Oxley was an endogenous choice, it would not be surprising that we find that high volatility companies have a higher non-compliance risk than low volatility companies. If the alternate explanation posited above is correct then, some forms of mandated corporate governance, such as internal controls, while decreasing the probability of non-compliance, may do so at the cost of impeding the ability of the manager to react effectively and quickly to the underlying business environment.

Our evidence suggests that difficulty of compliance for smaller public companies cannot be due solely to their lack of scale economies. If the current standard for compliance is, instead, geared to low volatility companies in which internal controls are easier to implement then a similar standard may not be well-suited for the environment of highly volatile companies, regardless of the cost of implementation. Companies in more volatile environments may have a larger risk of non-compliance, not because they may have a greater degree of problems in financial reporting but because, prior to Sarbanes-Oxley, they might not have thought it economically efficient to have the type of internal governance that has come to be associated with the Act. Thus, such companies may face a greater probability of non-compliance because of their inexperience with the types of control systems auditors expect or because the standards by which such systems are judged may not what they believe to be well-suited for their effective

operation.<sup>31</sup> Our results suggest that a greater emphasis on risk-based auditing standards that takes into account the two-sided nature of management discretion may be more appropriate for those companies that have greater volatility.<sup>32</sup>

## VIII. CONCLUSION

This is the first paper to present evidence on the economic consequences of Section 408 of the Sarbanes-Oxley Act. The criteria proposed by Section 408 can be considered as guidelines for assessing both the risk and potential harm from non-compliance in use in allocating scarce resources. Using evidence of weak internal controls from Section 404 audits as a proxy for potential non-compliance, we present evidence that the Section 408 review criteria that is hypothesized to be associated with an increased risk of non-compliance is related to the probability of a disclosure of a material weakness. We find a positive relation between high stock price volatility and whether a company is considered emerging with a disparate PE ratio and reports of material weakness in our data.

Despite its status as a Section 408 review criterion and consistent with prior literature, companies with large market capitalization, even after controlling for other variables for which size might be a proxy, do not report material weaknesses more frequently than other companies. We are aware, however, that the value to investors of frequent and careful review of the largest companies may still be high because the amount of capital at risk may be greater even if the

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<sup>31</sup> Smaller public companies may also fail the Section 404 audit if the scale of the company affects the determination of whether a particular weakness is material. In other words, the same internal control deficiency in a large company might not rise to the level of disclosure as in a smaller company. The same internal control deficiency that exists in both large and small companies may only be disclosed by smaller companies, therefore, leading to the perception that smaller companies have more difficulty complying with Section 404.

<sup>32</sup> Consistent with this conclusion, the SEC has recently adopted *Amendments to Rules Regarding Management's Report on Internal Control Over Financial Reporting*, 17 CFR Parts 210, 228, 229 and 240, (<http://www.sec.gov/rules/final/2007/33-8809.pdf>) that sets forth a risk-based approach for management's assessment of the effectiveness of internal controls. At the same time, the PCAOB has proposed guidance for auditors under AS5 (<http://www.sec.gov/rules/pcaob/2007/34-55876.pdf>).

possibility of reporting deficiencies is low. Thus, we find that the potential economic capital at risk of a disclosure of a material weakness in large companies is 11 times greater than in a smaller company. Further, for companies disclosing a material weakness, large companies comprise 92% of the market capitalization of these companies.

This evidence of a relation between our measures of Section 408 factors and the results of Section 404 audits suggests there is a consistency of objectives within the different parts of the Sarbanes-Oxley Act. Specifically, the two sections of the Act appear to target similar companies – the high volatility companies that we regard as most susceptible to the exercise of management discretion, following prior literature. While there is a strong relation between volatility and low market capitalization, volatility retains its explanatory power after taking low market capitalization and other Section 408 factors into account. Volatility is not overshadowed by firm size in explaining the disclosures of material weaknesses that have emerged from the initially mandated Section 404 audits.

In addition, our evidence suggests that those who might attribute the high frequency of adverse internal control audit outcomes among small companies to their size alone would inappropriately ignore the role of volatility as a determinant of the probability of a reported material weakness in internal controls.<sup>33</sup> Although smaller companies, as a whole, are more likely to report material weaknesses in internal controls, small companies with low volatility are not significantly more likely to report a material weakness than large companies with low volatility. Therefore, the volatility of the company may be a more important component for consideration in the debate surrounding any change in the implementation in Section 404 than simply company size.

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<sup>33</sup>See The Final Report of the Advisory Committee on Smaller Public Companies, April 23, 2006 (<http://www.sec.gov/info/smallbus/acspc/acspc-finalreport.pdf>).

Our evidence – that reforms under the Sarbanes-Oxley Act targeted companies in which managers have the greatest scope for discretion – suggests that the accounting scandals in companies as large as Enron and Worldcom revealed weaknesses in the internal governance mechanisms on which investors had relied for assurance. Our findings do not permit rejection, however, of an alternative hypothesis in which the initial implementation of Section 404 had the unintended consequence of eliminating or deterring the exercise of management discretion in some instances where it would have benefited shareholders.

## Appendix 1

### Sarbanes-Oxley Act of 2002

#### Section 408: Enhanced Review of Periodic Disclosures by Issuers

(a) **REGULAR AND SYSTEMATIC REVIEW.**- The Commission shall review disclosures made by issuers reporting under section 13(a) of the Securities Exchange Act of 1934 (including reports filed on Form 10-K), and which have a class of securities listed on a national securities exchange or traded on an automated quotation facility of a national securities association, on a regular and systematic basis for the protection of investors. Such review shall include a review of an issuer's financial statements.

(b) **REVIEW CRITERIA.**- For purposes of scheduling the reviews required by subsection (a), the Commission shall consider, among other factors-

- (1) issuers that issued material restatements of financial results;
- (2) issuers that experience significant volatility in their share price as compared to other issuers;
- (3) issuers with the largest market capitalization;
- (4) emerging companies with disparities in price to earnings ratios;
- (5) issuers whose operations significantly affect any material sector of the economy; and
- (6) any other factors that the Commission may consider relevant.

(c) **MINIMUM REVIEW PERIOD.**- In no event shall an issuer required to file reports under section 13(a) or 15(d) of the Securities Exchange Act of 1934 be reviewed under this section less frequently than once every 3 years.

**Appendix 1, cont'd**  
**Sarbanes-Oxley Act of 2002**

**Section 404: Management Assessment of Internal Controls**

(a) RULES REQUIRED.- The Commission shall prescribe rules requiring each annual report required by section 13(a) or 15(d) of the Securities Exchange Act of 1934 to contain an internal control report, which shall--

(1) state the responsibility of management for establishing and maintaining an adequate internal control structure and procedures for financial reporting; and

(2) contain an assessment, as of the end of the most recent fiscal year of the issuer, of the effectiveness of the internal control structure and procedures of the issuer for financial reporting.

(b) INTERNAL CONTROL EVALUATION AND REPORTING.- With respect to the internal control assessment required by subsection (a), each registered public accounting firm that prepares or issues the audit report for the issuer shall attest to, and report on, the assessment made by the management of the issuer. An attestation made under this subsection shall be made in accordance with standards for attestation engagements issued or adopted by the Board. Any such attestation shall not be the subject of a separate engagement.

**Appendix 2**  
**Variable Definitions: Mapping of Suggested Section 408 Review Criteria (“Factors”)**

Suggested Section 408 Review Criterion	Variable
<i>Risk of Non-Compliance:</i>	
High Share Price Volatility	Company’s volatility is above the median where volatility is as the residual volatility from the standard market model.
Emerging Company	Age in bottom quartile (CRSP)
Disparate PE Ratio	Value of the EPS/Price ratio is in the bottom quartile (Compustat), 0 otherwise
Emerging Company w/ Disparate PE Ratio	1 if both age and EPS/Price ratio are in bottom quartile, 0 otherwise
<i>Potential Harm from Non-Compliance:</i>	
Largest Market Capitalization	1 if Market Capitalization is above median, 0 otherwise (CRSP)
Operations Significantly Affects Material Sector of Economy	1 if company share of industry (2-digit SIC) revenue is in top quartile of all companies’ share of industry revenue, 0 otherwise

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**Table 1**  
**Sample Construction**

This table provides information on the sample construction. The number of observations is listed with the percentage of the initial sample of 3,827 in parentheses.

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<i>Initial Sample: All Internal Control (404) Audits</i>	3,827
Material Weakness=0	3,237 (84.6%)
Material Weakness=1	590 (15.4%)
Less: Double disclosure	74 (1.9%)
Material Weakness=0	51 (1.3%)
Material Weakness=1	23 (0.6%)
Less: Missing or duplicate GVKEY/CIK match	167 (4.3%)
Material Weakness=0	150 (3.9%)
Material Weakness=1	17 (0.4%)
Less: Missing CRSP or Compustat Data	
Material Weakness=0	195 (5.1%)
Material Weakness=1	47 (1.2%)
<i>Final Sample</i>	3,344 (87.4%)
Material Weakness=0	2,841 (85% of final sample)
Material Weakness=1	503 (15% of final sample)

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**Table 2**  
**Summary Statistics for the Full Sample**

Summary statistics for the full sample of firms that have reported on internal controls in *Audit Analytics*.  $\sigma_{\varepsilon}$  is the standard error term from the market model estimated using daily data from CRSP from 12 months prior to the fiscal year end to 24 months prior to the fiscal year end. Data on EPS, share price, shares outstanding, revenue and assets at the end of the second quarter is obtained from Compustat. Age is the inception date of the firm on CRSP. Market capitalization, assets and revenue are measured in millions.

Variable	Mean	Median	Minimum	Maximum	N
$\sigma_{\varepsilon}$	0.025	0.021	0.006	0.129	3,344
Market Capitalization	\$3,820	\$645	\$8	\$343,590	3,344
PE Ratio	17.45	16.50	-1,200.00	1,843.00	3,226
EP Ratio	0.0032	0.043	-5.77	1.82	3,235
Age	16	11	0	43	3,344
Revenue	\$737	\$112	\$0.005	\$70,466	3,344
Assets	\$7,359	\$812	\$0.59	\$1,396,568	3,344

**Table 3**  
**Correlations**

Spearman/Pearson correlations among variables for the full sample of firms that have reported on internal controls in *Audit Analytics*. Spearman correlations are in the lower left diagonal and Pearson correlations are in the upper right diagonal.  $\sigma_\varepsilon$ , the standard error term is from the market model estimated using daily data from CRSP from 12 months prior to the fiscal year end to 24 months prior to the fiscal year end. Data on EPS, share price, shares outstanding, revenue and assets at the end of the second quarter is obtained from Compustat. Age is the inception date of the firm on CRSP. \*\*\*, \*\*, \* indicate significance at the 1%, 5% or 10% levels.

Variable	$\sigma_\varepsilon$	Market Capitalization	EP Ratio	Age	Revenue	Assets
$\sigma_\varepsilon$		-0.16***	-0.34***	-0.32***	-0.16***	-0.12***
Market Capitalization	-0.50***		0.05***	0.22***	0.72***	0.57***
EP Ratio	-0.44***	0.22***		0.11***	0.08***	0.05***
Age	-0.35***	0.30***	0.22***		0.23***	0.11***
Revenue	-0.43***	0.76***	0.39***	0.38***		0.52***
Assets	-0.63***	0.77***	0.40***	0.31***	0.77***	

**Table 4**  
**Percentage of Material Weakness Disclosures by Section 408 Factor**

Percentage of firms disclosing a material weakness in internal controls based on Section 408 factors. High is defined as a firm whose  $\sigma_{\varepsilon}$ , or market capitalization is above the median, a firm with both age and EPS/price ratio in the lowest quartile or a firm whose percent of its own industry revenue is in the highest quartile of all firm's percent of industry revenue.  $\sigma_{\varepsilon}$ , the standard error term is from the market model estimated using daily data from CRSP from 12 months prior to the fiscal year end to 24 months prior to the fiscal year end. Data on EPS, share price, shares outstanding, revenue and assets at the end of the second quarter is obtained from Compustat. Market capitalization, assets and revenue are measured in millions. Age is the inception date of the firm on CRSP. t-statistics are in parentheses (assuming unequal variances). \*\*\*, \*\*, \* indicate significance at the 1%, 5% or 10% levels.

Section 408 Factor	High	Low	Difference in Means
<i>Risk of Non-Compliance</i>			
Volatility: $\sigma_{\varepsilon}$	20.7%	9.3%	11.4%*** (9.39)
Emerging Company and Disparate PE Ratio	27.3%	13.8%	13.5%*** (4.75)
<i>Potential Harm from Non-Compliance</i>			
Market Capitalization	9.9%	20.2%	-10.3%*** (-8.47)
Affect on Material Sector of Economy	9.3%	15.7%	-6.4%*** (-3.74)

**Table 5**  
**Summary Statistics: Conditional on Both Size and Volatility**

Summary statistics for the sample of firms that report on the effectiveness of their internal controls in *Audit Analytics*. High volatility is defined as companies whose  $\sigma_\epsilon$  is above the median and low volatility is defined as companies whose  $\sigma_\epsilon$  is below the median. Small companies are firms that have a market capitalization below the median and large companies are firms with market capitalization above the median. %MW is the percentage of firms disclosing a material weakness in internal controls.  $\sigma_\epsilon$ , the standard error term is from the market model estimated using daily data from CRSP from 12 months prior to the fiscal year end to 24 months prior to the fiscal year end. Data on EPS, share price, shares outstanding, revenue and assets at the end of the second quarter is obtained from Compustat. Market capitalization, assets and revenue are measured in millions. Age is the inception date of the firm on CRSP. Big 4 Auditor is 1 if the firm has a Big 4 auditor otherwise Big 4 Auditor is 0. T-statistics (unequal variances) are in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5% or 10% levels.

Variable	Panel A: Large Companies						Panel B: Small Companies						
	High Volatility			Low Volatility			High Volatility			Low Volatility			Difference In Means
	N	Mean		N	Mean		N	Mean		N	Mean		
%MW	529	16.3%		1,144	6.9%		1,156	22.8%		515	14.6%		8.2%*** (4.12)
$\sigma_\epsilon$	529	0.030		1,144	0.014		1,156	0.038		515	0.016		0.022*** (47.77)
Market Capitalization	529	\$2,725		1,144	\$9,497		1,156	\$268		515	\$309		-\$41*** (-4.58)
EP Ratio	512	-0.014		1,113	0.052		1,109	-0.058		501	0.047		-0.105*** (-8.96)
Age	529	13		1,144	22		1,156	12		515	15		-3*** (-6.25)
Revenue	529	\$702		1,144	\$1,694		1,156	\$93		515	\$92		-\$1 (-0.06)
Assets	528	\$3,983		1,143	\$18,789		1,156	\$399		515	\$1,076		-\$677*** (-9.31)
Big 4 Auditor	529	97%		1,144	98%		1,156	84%		515	74%		10%*** (4.47)

**Table 6**  
**Percent of Firms with Material Weaknesses by Size Decile and Volatility Quartile**

The percentage of firms reporting a material weakness in internal controls by decile of market capitalization and quartiles of volatility. The sample is from *Audit Analytics*. The first row of each market capitalization decile is the percentage of firms disclosing a material weakness in internal controls. The second row is the number of firms in that category and the final row is the percentage of firms in that category.  $\sigma_e$  is the standard error term from the market model estimated using daily data from CRSP from 12 months prior to the fiscal year end to 24 months prior to the fiscal year end. Market capitalization is measured in millions. Cells that have significantly more (fewer) than the full sample mean (15%) of material weaknesses disclosed are darkly (lightly) highlighted. <sup>-</sup> Denotes significantly less than the mean, <sup>+</sup> denotes significantly greater.

Market Capitalization (in mils)	Volatility ( $\sigma_e$ )				
	< 0.015	0.015 - 0.021	0.021 - 0.032	0.0324 - 0.129	Total
<128	12.5% 40	22.2% 54	19.7% 71	32.0% <sup>+</sup> 169	25.4% <sup>+</sup> 334
128 – 198	10.3% 29	11.3% 62	13.0% 92	25.8% <sup>+</sup> 151	18.3% 334
198 - 287	8.7% 23	12.5% 72	21.5% <sup>+</sup> 107	21.1% <sup>+</sup> 133	18.5% <sup>+</sup> 335
287 - 429	20.0% 40	12.1% 66	18.5% 108	29.2% <sup>+</sup> 120	21.3% <sup>+</sup> 334
429 - 644	19.0% 42	16.0% 94	18.1% 105	18.1% 94	17.6% 335
644 - 919	4.8% <sup>-</sup> 63	15.2% 92	11.9% 109	18.6% 70	12.9% 334
919 – 1,493	9.3% <sup>-</sup> 107	6.8% <sup>-</sup> 103	11.3% 80	24.4% 45	11.0% <sup>-</sup> 335
1,493 – 2,608	8.3% <sup>-</sup> 145	5.7% <sup>-</sup> 87	17.9% 67	20.0% 35	10.8% <sup>-</sup> 334
2,608 – 6,446	3.4% <sup>-</sup> 148	6.3% <sup>-</sup> 111	21.3% 61	26.7% 15	8.7% <sup>-</sup> 335
6,446 – 34,3590	5.0% <sup>-</sup> 199	6.3% <sup>-</sup> 95	11.1% 36	0.0% 3	6.0% <sup>-</sup> 334
Total	7.9% <sup>-</sup> 836	10.8% <sup>-</sup> 836	16.6% 836	24.9% <sup>+</sup> 836	15.0% 3,344

**Table 7**  
**Multivariate (Probit) Analysis of Disclosures of**  
**Material Weakness in Internal Controls**

Probit model for the sample of firms that report on the effectiveness of their internal controls in *Audit Analytics*. The dependent variable Material Weakness=1 indicates that the company has a material weakness in internal controls at the end of the fiscal year otherwise Material Weakness=0.  $\sigma_\varepsilon$  is the standard error term from the market model estimated using daily data from CRSP from 12 months prior to the fiscal year end to 24 months prior to the fiscal year end. Emerging Company with Disparate PE Ratio is a dummy variable equal to 1 if a firm has both an age and EPS/Price in the lowest quartile. Affect on Material Sector of Economy is a dummy variable equal to 1 if firm whose percent of its own industry revenue is in the highest quartile of all firm's percent of industry revenue. Small companies are firms that have a market capitalization below the median and large companies are firms with market capitalization above the median. Data on EPS, share price, shares outstanding, revenue and assets at the end of the second quarter is obtained from Compustat. Market capitalization is measured in millions. Age is the inception date of the firm on CRSP. Big Auditor is 1 if the firm has a Big 4 auditor. Chi squares are in parentheses. \*\*\*, \*\*, \* indicates significance at the 1%, 5% or 10% levels.

Independent Variables	Dependent Variable Material Weakness=0,1					
	All Companies					
	Model 1	Model 2	Model 3	Model 4	Large Companies Only Model 5	Small Companies Only Model 6
Intercept	-0.76*** (107.85)	-0.69*** (93.29)	-0.53*** (9.64)	-0.50*** (7.95)	-0.92** (5.35)	-0.81** (6.19)
$\sigma_\varepsilon$			11.63*** (37.45)	10.07*** (25.06)	23.36*** (29.56)	8.78*** (16.77)
Log(Market Capitalization)			-0.10*** (19.00)	-0.10*** (16.78)	-0.05 (1.21)	-0.03 (0.26)
Emerging Company with Disparate PE	0.47*** (33.32)			0.22** (5.99)		
Affect on Material Sector of Economy		-0.27*** (7.15)		0.04 (0.15)		
Big 4 Auditor	-0.38*** (24.14)	-0.37*** (22.81)	-0.22*** (7.37)	-0.23*** (7.51)	-0.51** (5.36)	-0.18** (4.13)
Industry Dummies	yes	yes	yes	yes	yes	yes
N	3,344	3,344	3,344	3,344	1,673	1,671
Log Likelihood	1,387	1,399	1,352	1,349	516	829

**Table 8**  
**Potential Market Capitalization Loss from Disclosure of a Material Weakness by Size**

The potential for economic loss is reflected in the total market capitalization of companies that disclose a material weakness in internal controls by company size. Market capitalization is from Compustat at the end of the 2004. Small companies are firms that have a market capitalization below the median and large companies are firms with market capitalization above the median. Data are obtained from Audit Analytics and Compustat.

Type of Company	Number of Companies	Percent of Companies Disclosing a Material Weakness	Average Market Capitalization (in mils)	Total Market Capitalization (in mils)	Percent of Total Market Capitalization of Companies Disclosing a Material Weakness
Panel A: All Companies					
Small companies	1,671	10.1%	\$281	\$469,551	0.7%
Large companies	1,673	4.9%	\$7,356	\$12,306,588	7.9%
Total	3,344	15.0%	\$3,821	\$12,776,139	8.6%
Panel B: Only Companies Disclosing a Material Weakness					
Small companies	338	67.2%	\$267	\$90,246	8.2%
Large companies	165	32.8%	\$6,155	\$1,015,575	91.8%
Total	503	100%	\$2,198	\$1,105,821	100%