行政院國家科學委員會

獎勵人文與社會科學領域博士候選人撰寫博士論文成果報告

中 華 民 國 99 年 04 月 01 日

國立政治大學博士學位證書

學生 翁總青

生於中華民國 陸拾捌（西元1979）年拾貳月 貳拾 日

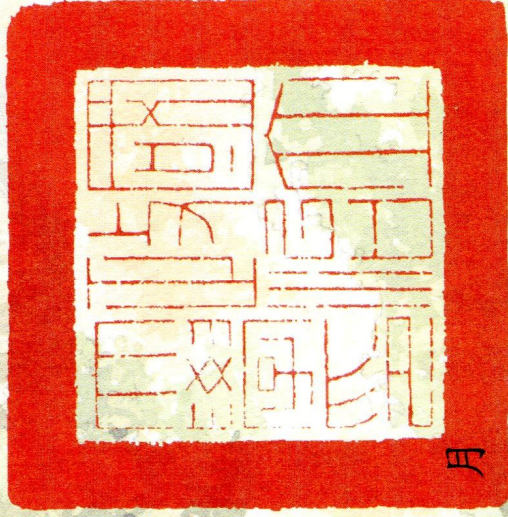在本校 商學院 會計學系

修業期滿成績及格准予畢業依學位授予法之規定

授予 商學博士 學位

院長 　

校長 吳思華

中華民國 九十九 年 二 月

國立政治大學會計系博士班博士論文

The Impact of Internal Control Reports on Information Precision and Market Liquidity

指導教授：金成隆博士

研究生：翁慈青

中華民國九十九年二月二十三日

The Impact of Internal Control Reports on

Information Precision and Market Liquidity

(Dissertation)

Advisor: Chen-Lung Chin

Ph. D Student: Tzu-Ching Weng

at the

Department of Accounting

National Chengchi University

Abstract

This dissertation extends prior research on internal control weaknesses (hereafter ICW) by examining the impact of internal control weakness and their remediation on information precision and market liquidity for firms filed Section 404 reports with the SEC. First, I find that the presence of ICW is associated with lower precisions of public and private information contained in analysts' earnings forecasts, which in turn increase overall information uncertainty. Second, I find that market liquidity is significantly lower for ICW firms. Moreover, this dissertation provides evidence that firm-level control weaknesses have stronger impact on public information precision and market liquidity than account-specific control weaknesses. Finally, this dissertation suggests that ICW remediation firms have higher information precision and market liquidity, compared to non-remediation firms. My results are robust after controlling for the endogeneity problem and other sensitivity tests.

Key words: Internal Control Weaknesses, Public Information Precision, Private Information Precision, firm-level/account-level weaknesses, Market Liquidity.

Table of contents

Ⅰ. Introduction

1. Motivation

The Sarbanes-Oxley Act (hereafter SOX) went into effect on July 30, 2002 to address the increasing concern of investors about the integrity of firms' financial reporting, due to scandals, such as Enron and WorldCom. Especially, Section 404 of SOX Act requires management to report on the effectiveness of the internal controls over financial reporting and auditors to attest to the validity of these reports.

However, Section 404 requirements have been subject to considerable debates, and much of controversy seems to be focused on the high costs of complying with Section 404, which are not commensurate with the corresponding benefits (Ogneva et al., 2007). Although regulators and auditors argue that Section 404 requirements should lead to higher financial reporting quality, and in turn lower cost of capital, research results regarding the success in achieving these goals are mixed, regardless of the effect of SOX on accruals quality[1] or on cost of capital.[2] For example, one stream of research focuses on the effect of Section 404 on financial reporting quality, and finds mixed evidence (Bedard, 2006; Doyle et al., 2007a; Ashbaugh-Skaife et al., 2008). Another stream of research examines the effect of SOX on cost of capital and also provides mixed evidence (Ogneva et al., 2007; Ashbaugh-Skaife et al., 2009). SEC registrants argue that high implementation costs are not commensurate with its perceived benefits, and hence, call for modification or repeal of this section (Ongeva et al., 2007). Many critics of Section 404 believe that the costs related to the

---

[1] Doyle et al. (2007a) document no significant difference in accrual quality between ICW firms and non-ICW firms under Section 404, while Ashbaugh-Skaife et al. (2008) find that ICW firms have lower accrual quality than non-ICW firms. However, Doyle et al. (2007a) further demonstrate that when material weakness disclosures are broken down by account-specific versus firm-level weaknesses, firm-level Section 404 weaknesses are related to poorer accrual quality.

[2] Ogneva et al. (2007) document no significant difference in their implied cost of equity estimates between ICW firms and non-ICW firms. In contrast, Ashbaugh-Skaife et al. (2009) find that ICW firms exhibit a significantly higher cost of equity capital, relative to non-ICW firms.

implementation of this regulation impose a significant burden on public companies (Solomon, 2005).

Because of a dispute about the cost-benefit trade-offs of Section 404, this dissertation provides empirical evidence on the influence of Section 404 on analysts' information environment. In contrast to prior research, which focuses on the effect of Section 404 on financial reporting quality or cost of capital, this dissertation examines the association between internal control weaknesses (hereafter ICW) and information precision contained in analysts' earnings forecasts. Moreover, this dissertation seeks to investigate the influence of internal control weaknesses on firms' market liquidity, in terms of information asymmetry in the capital market.

The first essay is to investigate whether information precision for ICW firms, as a proxy for the precisions of public and private information contained in analysts' forecasts, varies with the degree of internal control weakness. The public information precision component arises from public information disclosed by a firm and observed by most analysts and the private information precision component arises from idiosyncratic information gathered by individual analyst (Barron et al., 1998, 2002). Because weak internal controls can increase the error and dispersion in analysts' earnings forecasts for ICW firms (Kim et al., 2008; Xu and Tang 2009; Ongeva et al., 2007), this essay hypothesizes that more bias and errors of analysts earnings forecasts are mainly driven by less precise information contained in analysts' forecasts, which in turn lower the level of overall information environment. Although it is unclear that ICW would have a positive or negative effect on private information precision because of the two opposite perspectives about the association between public and private information precisions[3], I find that both the precisions of public and private

---

[3] Theoretical models traditionally argue that public and private information precisions are substitutes, and thus public information reduces market investors' incentives to develop private information (see Verrecchia 1982; Diamond 1985). In contrast, another perspective posits that a public release of

information contained in analysts' forecasts are lower for ICW firms than for non-ICW firms. Besides, the findings of this essay also support that overall information environment for ICW firms will be affected by weak internal control, since ICW firms lack capabilities or resources to effectively control firms' internal processes, and hence lead to noisy information to the public.

The objective of the second essay is to examine whether ICW firms exhibit poor market liquidity around the announcements of SOX 404 opinions. Because ineffective internal controls allow or introduce both intentional and unintentional misstatements into the financial reporting processes that lead to higher information risk and estimate risk (Ashbaugh-Skaife et al., 2009; Chan et al., 2008), ineffective internal control results in less reliable information to the public thus increasing information asymmetry faced by market participants that manifests in lower liquidity for these firms. Thus, even when an auditor provides an unqualified opinion on financial statements, users may view an adverse SOX 404 opinion as bad news. Thus, I posit that ICW firms exhibit higher information risk and estimate risk and thereby have lower market liquidity than non-ICW firms. Consistent with the conjecture, this essay finds that ICW firms have poor market liquidity in the capital market. I further find that ICW is positively associated with bid-ask spreads after controlling the public information precision, instead of controlling the private information precision. The plausible reason for the difference is that information produced by internal control system mainly consists of public information, rather than private information.

Furthermore, in both essays, I investigate the impact of the severity of ICW and remediation of previously ICW on information precision and market liquidity in the capital market. I partition ICW into two groups, such as account-specific and

---

information triggers agents with diverse information-processing skills to generate more accurate private information from the public announcement (e.g., Kim and Verrecchia, 1994, 1997).

firm-level weaknesses by using hand collected data. I find that firm-level control weaknesses have stronger influence on public information precision and market liquidity than account-specific weaknesses. For a remediation of internal control problems, this dissertation finds that ICW firms with remediation lead to enhance information precision and market liquidity.

In sum, this dissertation suggests that ineffective internal control systems not only undermine analysts' earnings forecasts, but also have a negative effect on analysts' information precision, overall information environment and market liquidity. Thus, internal control problems weaken information environment around ICW firms and reduce market participants' confidence in these firms' financial reporting processes.

2. Background

The SEC announced Section 404 on May 27, 2003 and required the firms with market capitalization greater than $75 million (accelerated filers) should comply with the rule for fiscal years ending on or after November 15, 2004. Managements should supply an "internal control report" that takes responsibility for adequate internal controls and assesses the effectiveness of the controls, and the firm's external auditors are required to attest the effectiveness of firm's internal controls over financial reporting in their annual 10-K filings and highlight any discovered material weaknesses.

In order to give auditor a guideline about attestation of internal control, the PCAOB issued Auditing Standard 2 (PCAOB, 2004) and defined material weakness as "a significant deficiency, or combination of significant deficiencies that results in a *more than remote* likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected", but was subsequently

substituted by Auditing Standard 5[4] (PCAOB, 2007) to implement Section 404. Specifically, Auditing Standard No. 5 modifies Auditing Standard No. 2 with the definition of internal control deficiencies. An important change of this standard is the likelihood that triggers a material weakness. Under Auditing Standard 5, the criterion "*reasonably possible*" replaces the criterion "*more than remote*". Thus, Auditing Standard No. 5 states the definitions of a material weakness as follows:

> *A material weakness*: which is a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a *reasonable possibility* (replaces "*more than remote likelihood*" defined by Auditing Standard No. 2) that a material misstatement of the company's annual or interim financial statements will not be prevented or detected on a timely basis.

The purpose of these provisions is to restore investor confidence in the capital markets in the aftermath of several corporate accounting frauds and subsequent financial distress such as Enron and WorldCom. The SEC regulators believed that disclosures of internal control problems are relevant and informative to information users. Moreover, the reporting of effectiveness of internal control can be a warning signal to information users to judge whether the firm's reporting system provides reliable financial information. According to the disclosure of internal control information, reporting users can have more confidence in the reliability of firms' financial reporting while management describes that it remains appropriate internal

---

4 The severity of weaknesses depends on (1) whether there is a reasonable possibility that the company's controls will fail to prevent or detect a misstatement of an account balance or disclosure; and (2) the magnitude of the potential misstatement resulting from the deficiency or deficiencies (Auditing Standard No.5).

control system.

However, in order to comply with Section 404, firms need to pay additional costs, such as audit fees, internal auditors' labor costs, and external consulting expenses, and even result in a substantial burden to maintain internal control systems. For instance, a recent survey estimates that, excluding external audit cost, firms spent an average of $5.9 million to comply with the requirements of Section 404 in their first year of the regulation compliance (Charles River Associates, 2005).

Due to higher cost of implementation of Section 404, the SEC has given non-accelerated firms another extension on compliance with Section 404, and wants firms to use the time wisely. "It is important for all public firms and their auditors to move toward full Section 404 compliance," the SEC Chairman Mary Schapiro mentioned (Aguilar, 2009). In fact, although the SEC permits non-accelerated firms to postpone the implementation of Section 404 until 2011, the SEC still encourage firms to comply with Section 404 early. Several organizations [5] also support the implementation of Section 404 and oppose any delay of this requirement, because they suggest that Section 404 requirements represent an appropriate SOX 404 opinion given an importance of internal control systems and gives significant benefits to investors (Aguilar, 2009).

Because of these cost and benefit conflicts, it is still an unsolved problem with the controversy. This dissertation wants to investigate the influence of implementing Section 404 on the information environment. My findings provide another implication for this regulatory debate by questioning the cost-benefit trade-offs of this regulation, at least in terms of information environment and information asymmetry.

---

5 These organizations are the Council of Institutional Investors, the Consumer Federation of America, the American Association of Individual Investors, and the CFA Centre for Financial Market Integrity.

Ⅱ.The Impact of Internal Control Reports on Information Precision

1. Introduction

Section 404 of the Sarbanes-Oxley (SOX) Act (U.S. House of Representatives 2002) requires management to report the effectiveness of the internal controls over financial reporting and auditors to attest the validity of these reports. SEC registrants argue that high implementation costs are not commensurate with its perceived benefits, and hence, call for modification or repeal of this section (e.g., Ongeva et al., 2007; Powell, 2005). Although regulators and auditors argue that Section 404 requirements should lead to higher financial reporting quality, and in turn lower cost of capital, several studies regarding the success in achieving these goals are mixed, regardless of the effect of SOX on accruals quality[6] or on cost of capital.[7] However, all these studies do not explore whether internal control weaknesses under Section 404 convey a bad signal to the market participants and impact ICW firms' information environment. This essay addresses these questions.

The essay investigates the association between internal control weaknesses and information precision contained in analysts' earnings forecasts. This essay presents an examination of whether analysts' public and private information precisions are related to a firm's weak information system, i.e. internal control system. The public information precision component arises from public information disclosed by a firm and observed by most analysts and the private information precision component arises from idiosyncratic information gathered by individual analyst (Barron et al., 1998, 2002). Specifically, I first explore the association between the presence of ICW and

---

[6]For example, Doyle et al. (2007a) document no significant difference in accrual quality between ICW firms and non-ICW firms under Section 404, while Ashbaugh-Skaife et al. (2008) find that ICW firms have lower accrual quality than non-ICW firms. However, Doyle et al. (2007a) further demonstrate that when material weakness disclosures are broken down by account-specific versus firm-level weaknesses, firm-level Section 404 weaknesses are related to poorer accrual quality.

[7]Ogneva et al. (2007) document no significant difference in their implied cost of equity estimates between ICW firms and non-ICW firms. In contrast, Ashbaugh-Skaife et al. (2009) find that ICW firms exhibit a significantly higher cost of equity capital, relative to non-ICW firms.

information environment including precisions of public and private information. I employ Barron et al. (1998) empirical proxies for the average precisions of analysts' public and private information sets to capture the underlying quality of investors' information sets. Second, prior studies show that there are differential effects on earnings quality among firms with firm-level weaknesses and firms with account-specific weaknesses (e.g., Doyle et al. 2007b). This essay further explores the relative effects of degree of the ICW severity on the precisions of public and private information contained in analysts' forecasts. Finally, I examine whether firms' initial disclosures of ICW and remediation of previously reported ICW are related to the precisions of public and private information contained in analysts' forecasts.

My first question to be addressed is whether the precisions of public and private information contained in analysts' earnings forecasts vary with the degree of internal control weakness. I explore whether the effect of public and private information precisions varies with quality of accounting information system, *per se*, i.e., the quality of internal control system. Prior empirical research suggests that ineffective internal control reduce the quality of analysts' earnings forecasts and analysts' belief (Ghosh and Lubbernik, 2006; Kim et al., 2008; Xu and Tang 2009; Ogneva et al, 2007). Since weak internal control is an determinant characteristic of analysts' forecasts (Kim et al., 2008; Xu and Tang 2009), I predict that poor quality of analysts' earnings forecasts for ICW firms might be mainly driven by less precise public information observed by most analysts. I assume that analysts' information environment are similar to those of investors. Barron et al. (2005) support this assumption by revealing that investors' trade consistent with analysts' information sets. Thus, I first hypothesize that ICW has a direct and adverse effect on the precision of public information in the capital market.

However, it is unclear that ICW would have a positive or negative effect on

private information precision. There are two opposite perspectives about the association between public and private information precisions. Theoretical models traditionally argue that public and private information are substitute, and thus public information reduces analysts' incentives to develop private information (Verrecchia 1982; Diamond 1985). In contrast, another perspective posits that a public release of information triggers analysts with diverse information-processing skills to generate more accurate private information from the public announcement (e.g., Kim and Verrecchia, 1994, 1997). Recent empirical research provides supporting evidence of the latter (Barron et al. 2002). In the ICW context, the substitute perspective argues that ICW firms are associated with lower precision of private information, but the complimentary perspective posits that ICW firms are associated with higher precision of private information. Therefore, I do not predict the sign of the effect of ICW firms on precision of private information contained in analysts' forecasts.

The second question I address is whether there is differential relation between information precision and different types of internal control weaknesses. As indicated by Moody's Investors Service (2006, 2007), the severity of weakness varies significantly within material internal control weaknesses. Account-level weaknesses are auditable and thus do not represent as serious a concern regarding the reliability of the financial statements. In contrast, firm-level material weaknesses are less "auditable" and thus more likely to result in less accurate financial information.[8] Much of information which investors use in their evaluation is provided directly from the firm (Lang and Lundholm, 1996). Accordingly, I predict that firm-level weaknesses have a stronger negative effect on the quality of analysts' forecasts than account-specific weakness, and in turn a relatively stronger impact on information

---

[8] Doyle et al. (2007a, 2007b) provide supporting evidence that firm-level material weaknesses will have a stronger association with accruals quality than account-specific material weaknesses.

precision including in public information precision and private information precisions (Verrecchia 1982; Diamond 1985).

The final question I address is whether firms whose auditors confirm remediation of previously reported ICW have more precise public and private information relative to firms that do not remediate their internal control problems. These tests are motivated by prior evidence that earnings quality will be improved for ICW firms which remediate their internal control problems. For example, Ashbaugh–Skaife, et al. (2008) document that firms whose auditors confirm remediation of preciously reported internal control weaknesses exhibit an increase in earnings quality relative to firms failing to remediate their control problems. However, they does not examine whether the remediation of their internal control weaknesses positively affects analysts' information quality.

To conduct my tests, I identify a sample of firms that has at least one SOX 404 audited opinion on internal control system. Following prior studies (Barron et al., 2002; Byard and Shaw, 2002; Venkataraman, 2000; Botoson et al., 2004;), I employ Barron et al (1998) empirical proxies for the precisions of analysts' public and private information sets to be mirror of investors' information sets. I find that ICW firms have both lower precisions of public and private information contained in analysts' earnings forecasts, which in turn worsen the overall information environment. I further find that there are differential effects on public and private information precisions among ICW firms, and the negative association between the presence of ICW and precision of information is stronger for firms with firm-level weaknesses than for those with account-specific weaknesses. Third, empirical analyses show that private and public information precisions are significantly higher for firms remedying previously weakness relative to firms who fail to remedy their weaknesses.

As a robustness check, I conduct several further analyses. First, an important concern regarding my specifications is the endogeneity issue. After controlling the selection bias, my primary findings are robust and remain qualitatively unchanged. Second, following Ashbaugh-Skaife et al. (2008), and Kim et al. (2008), I conduct intertemporal analysis of SOX 404 opinions across successive years. The analysis of successive year SOX 404 opinions indicates that firms whose internal controls improve exhibit an increase in public and private information precisions. The results are also robust after controlling fixed or random effect.

This essay contributes to the literature in several important aspects. First, it contributes to the literature on internal control and information precision by empirically linking the strength of firm's internal control over financial reporting to analysts' information quality through SOX 404 reporting. While prior studies show that public information disclosure leads to the change in public and private information precisions (e.g., Barron et al., 2002), I further provide evidence that quality of accounting information systems (i.e., internal control), per se, that produce that information is also a critical determinant of analysts' information precision.

Second, this essay also contributes to the literature designed to assess economic consequences of Section 404. In response to the concerns of public that Section 404 provides little benefits to investors (e.g., Burn, 2007), regulators and auditors argue that Section 404 requirements should result in higher quality of financial reporting, and in turn lower cost of capital. While prior research focuses primarily on specific economic consequence of Section 404 Act, and empirical results regarding the success in achieving these goals are mixed, my findings provide stronger evidence that internal control weaknesses lead to reduced quality of *overall* information environment as well as analysts' public and private information precisions. As a result, this essay also contributes to the intense debate regarding costs and benefits of Section

404 and has policy implications for regulators.

Fourth, this essay has an implication for the debate between regulators and registrants. The public firms argue that they focus on unnecessary controls over routine processes and their high costs of complying with Section 404 are not commensurate with its perceived benefit (American Bankers Association, 2005; Financial Executives Institute, 2005; Powell, 2005)[9]. However, I provide evidence that effective internal controls enhance a firm's information environment by increasing analysts' public and private information quality and improving information uncertainty. Thus, the implementation of Section 404 Act will help to enhance analysts' information quality and is more informative to the market participants. Thus, my results have implications for the debate about whether to implement this provision for smaller public companies. These findings support that the disclosures of internal control systems in public companies can provide more information and more benefit to the market participants.

Finally, this essay also contributes to the literature on the association between public and private information precisions. While theoretical model documents that there are two opposite perspectives about the relation between public and private information precisions, I empirically show that these two types of information precision are complementary, at least in the context of internal control weakness.

The remainder of this essay is organized as follows. Related literature and hypothesis development are discussed in Section 2. The sample and the research design are shown in Section 3. The empirical results and the conclusions are presented in Section 4 and in Section 5.

---

[9] Powell (2005) suggests that as a result of Section 404 Act, auditors' fees have been doubled, with a disproportionately larger burden falling on smaller companies and, hence, calls for modification or repeal of the section.

2. Literature Review and hypothesis development

2.1 The impact of internal control weaknesses on information precision

Prior to the passage of SOX Act, the SEC had little authority over a firm's operational matters or their internal control system. However, SOX Act significantly changes the information environment of accelerated firms by requiring disclosures about a firm's internal controls under Sections 302 and 404. Section 302 requires managers to report any discovered material weaknesses to their external auditor and the audit committee. Section 404 further requires auditors to provide an opinion on the assessment of internal control made by the management in annual reports. Recent studies investigating the characteristics of firms revealing internal control weaknesses under Section 302 and 404 find that firms disclosing material weaknesses are more complex, smaller, less profitable, recent changes in organizational structure, and more risk exposure (Ge and McVay, 2005; Doyle et al., 2007a; Ashbaugh-Skaife et al., 2007).

Because of high costs of complying with Section 302 and 404, accelerated firms bear a higher cost of implementation, especially ICW firms. In order to respond to higher levels of control risk and attestation cost, audit fees are significantly higher for firms with internal control weaknesses and these fees increase in the severity of control weaknesses (Raghunandan and Rama, 2006; Hoitash et al, 2005; Hogan and Wilkins, 2008). Internal control weaknesses also negatively affect lenders' assessment of the risk of extending a line of credit. An adverse SOX 404 opinion reduces lenders' confidence and affects their decisions (Schneider and Church, 2008). Stock price reaction to the disclosures of internal control weaknesses is also more negative for firms with material weaknesses (De Franco et al. 2005; Hammersley et al., 2008; Beneish et al., 2008). A significantly negative market reaction represents that the existence of internal control weakness disclosures causes market participants to

re-estimate their valuation of the quality of management's control ability over the financial reporting process, and then lead to decline in expectations of the firm's future cash flow or to increase in estimation of the firm's risk (De Franco et al. 2005; Hammersley et al., 2008; Beneish et al., 2008).

If weak internal control systems increase measurement errors or managers' inability to control the business, then market participants may identify these firms with low level of information transparency (Kinney, 2000; Moody's 2006). Prior research documents that ineffective internal controls allow or introduce both intentional and unintentional misstatements into the financial reporting processes that lead to lower the level of information quality (Moody's, 2006). For example, weak internal controls can reduce the disclosure quality (Kinney, 2000). Several studies document that ineffective internal controls influence analysts' forecasts. Ghosh and Lubbernik (2006) find that errors and bias in analysts' earnings forecasts are larger for firms reporting internal control problems. Kim et al. (2008) and Xu and Tang (2009) suggest that weak internal controls can increase the likelihood of error and dispersion in analysts' earnings forecasts. Ogneva et al. (2007) find that analysts' forecasts are relative more forecast bias for ICW firms.

If a firm's management lacks abilities or resources to exercise efficient internal control, it will be difficult for the managers to prepare proper and reliable financial process and to provide any adequate and creditable internal information to the public (Ge and McVay, 2005). As information processors, analysts will take into account the information stemming from managers' inability to control the business when predicting their earnings forecasts. Because managers of ICW firms lack capabilities or resources to effectively control firms' financial reporting process, it will lead to noisy information disclosed to the public and impact analysts' earnings forecasts.

Prior research documents that analysts' forecasts are affected by information

uncertainty among analysts, which is comprised of public and private information precision (Barron et al., 1998, 2002). While extant literature focuses primarily on the specific economic consequence of internal control weaknesses (Ogneva et al., 2007; Beneish et al., 2008; Kim et al. 2008; Xu and Tang, 2009), little work to date investigates the influence of weak internal control on private and public information precisions, and even overall information environment. I thus investigate whether specific characteristics of internal control convey information to analysts in the capital market.

Since much of information which market participants use in deriving their investment decisions is directly provided by a firm (Verrecchia 1982; Diamond 1985), the extant literature on information environment documents that firms with more public disclosure have more accurate analyst earnings forecasts, less dispersion among individual analysts, lower cost of capital and information asymmetry (e.g., Yohn, 1998; Hope, 2003a; Hope, 2003b; Ramnath et al., 2008). Thus, I posit that because ICW firms convey less accurate information signal and then result in more errors and bias in analysts' earnings forecasts, the information analysts observed and acquire for ICW firms will be impaired. I expect that the precision of public information contained in analysts' earnings forecasts is lower for ICW firms, compared to non-ICW firms. The hypothesis is as follows:

H1a: Internal control weakness is negatively associated with public information precision contained in analysts' forecasts.

Each firm's information environment is comprised of public and private information. In contrast to public information precision, the effect of internal control weakness on private information precision is more unclear. Extant literature posits

15

that there are two differential perspectives about the association between public and private information precisions. Traditional perspective ("*substitute*" perspective) argues that higher degree of public information precision reduces market participants' incentives to generate more precise private information, if the public and private information are substitutes. This in turn reduces the amount and the precision of uniquely private information in the capital market (Verrecchia 1982). In contrast, "*complementary*" perspective argues that public announcements create private beliefs (Harris and Raviv, 1993; Kandel and Pearson, 1995) since there are differential prior beliefs or likelihood functions among market investors. Holthausen and Verrecchia (1990) model public disclosures as signals with both common and private error components, which implicitly assume that public announcements can create private beliefs. Kim and Verrecchia (1994, 1997) argue that a public release of information triggers analysts with diverse information-processing skills to generate new idiosyncratic information from the public announcement. Recent empirical research supports the latter (Lundholm, 1988; Venkataraman 2000; Barron et al., 2002).

In the context of internal controls, the "*substitute*" perspective argues that since ICW firms reveal noisy information to the public and thereby reduce public information precision, analysts, who intend to enhance earnings forecast accuracy for ICW firms, have greater incentives to develop more precise private information. Accordingly, ICW leads to higher level of private information precision. This argument is consistent with those by Lang and Lundholm (1996), who show that analysts place more weight on their private information as the firm's disclosure policies decrease. On the other hand, "*complementary*" perspective posits that due to different prior beliefs or likelihood functions among analysts or other market participants, higher level of public information precision arising from non-ICW firms enhances the possibility of trigging generation of private information, and in turn

leads to more precise private information. On the contrary, analysts have less motivation to acquire more precise private information when they anticipate a less precise public information disclosure for ICW firms. Thus, the lower level of public information precision for ICW firms results in lower accurate private information.[10]

According to the above arguments, I do not predict the sign of the effect of ICW on the precision of private information. Thus, the hypothesis is as follows:

H1b: Internal control weakness is associated with the private information precision.

2.2 The severity of internal control weakness and information precision

Moody's (2006, 2007) and Doyle et al. (2007) suggests that the severity of internal control problems varies substantially within the material weakness classification, and proposes that material weaknesses fall into one of two categories., account-specific or firm-level weaknesses. Thus, I classify internal control weaknesses as either *account-specific* or *firm-level* weaknesses:

Account-specific weaknesses: the weaknesses related to internal control over specific account balances or transaction-level processes.

Firm-level weaknesses : the weaknesses related to company overall controls, such as an ineffective control environment, weak financial reporting processes or ineffective personnel.

---

[10] Furthermore, analysts' own benefits will affect their incentives to convey their private information into their forecasts, making Hypothesis 1b more unclear. For example, regardless of how ICW affect the precision of private information, there are opposite incentives for analysts to convey their private information (Fischer and Verrecchia, 1998). On the one hand, risk-averse analysts prefer to release their private information because they more care about the adverse effects of price changes resulted from inconsistent forecast of other analyst. Conversely, less risk-averse analysts prefer to hold their private information because they expect they can gain more benefit if they impound more private information in their forecasts. Therefore, analysts have differential incentives to decide whether they should convey their private information in their forecasts. This, in combination with the unclear association between the public and private information, make it to be more unclear whether the effect of ICW is positively or negatively related.

Doss and Jonas (2004) suggests that account-specific weaknesses are auditable by performing additional substantive procedures, and do not result in a serious concern of reliability of the financial statements. However, Firm-level material weaknesses are related to more fundamental problems, which auditors may not be able to audit effectively and result in an increased likelihood of financial reporting problems. Thus, firm-level weaknesses lead to doubt about not only management's ability to report accurate financial statements, but also its ability to control the business. Doyle et al. (2007b) suggest that ICW firms with firm-level weaknesses have lower accruals quality relative to ICW firms with account-specific weaknesses.

Consequently, unable to efficiently maintain internal control systems and processes, managements of firms with firm-level control problems are not capable of preparing adequate financial process and controlling the business (Doss and Jonas, 2004). Thus I predict that firm-level weaknesses have a stronger effect on public and private information precisions than account-specific weaknesses. This leads to the second hypothesis:

H2: Firm-level control weaknesses have a stronger association with public and private information precisions than account-specific control weaknesses.

2.3 The effect of remediation of ICW firms

In the analyses of successive year SOX 404 opinions, Ashbaugh-Skaife et al. (2008) document that firms whose auditors confirm remediation of previously reported internal control deficiencies (going form adverse to unqualified SOX 404 opinion) exhibit a significant improvements in accrual quality relative to ICW firms that fail to remediate their control problems. Li et al. (2007) find that ICW firms are more likely to experience CFO turnover, and the quality of new CFO is positively

related to an improvement in internal control systems. Therefore, in order to receive an unqualified SOX 404 audit opinion in successive years, ICW firms will use several mechanisms to remediate their weak control system, such as effective monitoring of operations, effective internal audit, continuous risk analysis and follow-up to unusual results (Krishnan et al., 2008; Li et al., 2008). Li et al. (2008) also find that remediation is associated with the improvements in various characteristics of boards of directors, audit committees, and an increase in the percentage of shareholding s and top managements. When ICW firms which previously received adverse SOX 404 audit opinion remedy their control systems in successive years, the improvements can result in more effective design and operation of internal control systems and thus in turn better earnings quality (Ashbaugh-Skaife et al. 2008).

Since the remediation firms will exhibit more improvement on quality of financial information disclosure than non-remediation firms (Ashbaugh-Skaife et al. 2008), I posit that public information would be more precise for ICW firms remedying their internal control problems relative to ICW firms with continuing weak internal control. This leads to the following hypothesis as below:

H3a: Remediation firms exhibit an increase in public information precision relative to non-remediation firms.

As discussed earlier, there are two opposite perspectives about the relation between public and private information precisions: *substitute* and *complementary* effects. Therefore, it is unclear that public information disclosure reduces or enhances analysts' incentive to collect and process more accurate private information. In the same vein, when remediation firms disclose higher earnings quality, the change in precision of private information is unclear. Thus, I do not predict the direction of the

influence of remediation on private information precision. This hypothesis is as follows:

H3b: Remediation firms exhibit an association with private information precision relative to non-remediation firms.

3. Research Design and Data Sources

3.1 Research Design

In this section, I present the regression models and discuss in detail the measures of the precisions of public and private information, followed by a discussion of the choice of sample.

3.1.1 The impact of internal control weakness on information precision

To test Hypotheses 1a and 1b that the presence of ICW is associated with public and private information precisions, I estimate the following regression in equations (1) and (2):

$$RPUBLIC_{i,t=}a_0+a_1ICW_{i,t+}a_2Big4_{i,t+}a_3Opinion_{i,t}+a_4Horizon_{i,t}+a_5Size_{i,t}+a_6Surprise_{i,t}$$
$$+a_7ROA_{i,t}+a_8Lev_{i,t}+a_9Growth_{i,t}+a_{10}Loss_{i,t}+a_{11}Stdroe_{i,t} +\varepsilon \qquad (1)$$
$$RPRIVATE_{i,t=}b_0+b_1ICW_{i,t+}b_2Big4_{i,t+}b_3Opinion_{i,t}+b_4Horizon_{i,t}+b_5Size_{i,t}+b_6Surprise_{i,t}$$
$$+b_7ROA_{i,t}+b_8Lev_{i,t}+b_9Growth_{i,t}+b_{10}Loss_{i,t}+b_{11}Stdroe_{i,t} +\varepsilon \qquad (2)$$

To be consistent with Hypothesis 1a, the coefficient on *ICW* (a_1) is expected to be negative in equation (1). In addition, as mentioned in Hypothesis 1b, I do not hypothesize a directional relationship between the presence of internal control weaknesses and private information precision. As a consequence, I do not predict the sign of coefficient on *ICW* (b_1) in equation (2).

Dependent variables

RPUBLIC   = fractional rank of public information precision for firm i, year t. The public information precision (*PUBLIC*) is drawn from Barron et al. (1998) and Botosan et al. (2004). Public information precision represents signal common information disclosed by a firm and observed by whole analysts. The public information precision from analysts, *PUBLIC*, is defined as follows:

$$PUBLIC = \frac{SE - (D/N)}{[(SE - (D/N) + D]^2}$$

RPRIVATE   = fractional rank of public information precision for firm i, year t. The private information precision, (*PRIVATE*) is drawn from Barron et al. (1998) and Botosan et al. (2004). Private information precision is defined as signal unique information observed and acquired by each analyst. The private information precision, *PRIVATE*, can be defined as follows:

$$PRIVATE = \frac{D}{[(SE - (D/N) + D]^2}$$

Where SE=expected square error in the mean forecast= $(\overline{F_{it}} - A_{it})^2$; D=expected forecast dispersion $= \frac{1}{N-1}\sum_{i=1}^{N}(\overline{F_{it}} - F_{ijt})^2$. N= the number of forecasts; $\overline{F_{it}}$ =mean forecast for firm i, year t; A_{it} =actual earnings forecasts for firm i, year t; and F_{ijt} = analyst j's forecast of earnings for firm i, year t.

Following Botosan et al. (2004), I estimate public and private information precisions using analysts' most recent one-quarter-ahead forecasts *before* the announcement of SOX 404 opinion. Prior studies show that estimated measures of public and private information, *PUBLIC* and *PRIVATE*, are heavily skewed to the right (Gu, 2004; Botosan et al., 2004), I thus follow Botosan et al. (2004) and use fractional ranks of public and private information precisions, *RPUBLIC* and *PRIVATE*,

as proxies for public and private information precisions, respectively, in equations (1) and (2).

Independent variable

ICW   = 1 if the firm i discloses material weakness in internal control, and 0 otherwise.

Control variables

Big4   =   1 if auditor is Big4, and 0 otherwise firm i;

Opinion   =   1 if a firm i reveals a clean opinion, and 0 otherwise;

Horizon   =   the period between analyst forecast date and financial reporting date;

Size   =   logarithm of assets, measured at the end of fiscal year t-1 for firm i;

Surprise   =   (net income in current year- net income in last year)/net income in last year;

ROA   =   the ratio of return to asset, calculated as earnings before extraordinary items scaled by average total assets for firm i, year t;

Lev   =   the ratio of debt to averaged total assets for firm i, year t;

Growth   =   market value of equity divided by book value of equality for firm i, year t;

Loss   =   1 if last firm-year observation revealed negative earnings, and 0 otherwise for firm i, year t;

Stdroe   =   standard deviation of return of equity over the previous five years for firm i;

Regarding control variables, I include *Big4* in equation (1) since auditor quality is inversely associated with analysts' consensus forecast error and dispersion (Behn et al. 2008; Kim et al. 2008). *Opinion* is included since an unclean audit opinion increases the likelihood of financial reporting misstatement (Francis and Krishnan, 1999; Bartov et al., 2000; Bradshaw et al., 2001), and in turn may affect analysts' forecasts and their public information precision. The unqualified opinions and the modified opinions with harmless explanatory language are coded *Opinion*=1 and are labeled as clean opinions. The other opinions (mostly going concern, qualified

opinions, adverse opinions and disclaimer of opinions) are coded *Opinion*=0 and are labeled as unclean opinions. *Horizon* is included since a forecast announced closer to the actual earnings announcement date is more accurate than a forecast announced in the earlier period (Baginski and Hassell, 1997; Behn et al. 2008).

I also control for several firm-specific variables. *Size* is included since there is a positive association between firm size and forecast accuracy (Lang and Lundholm, 1996). However, firm size could also proxy for the complication (Xu and Tang, 2009), for which prediction for the relation to public information precision is negative. Thus, I do not expect the direction of the coefficient on *Size*. *Surprise* is used to control for any effect on analysts' reaction to the level of surprise in earnings (Byard and Shaw, 2003). I expect that larger earnings surprises are associated with less precise public information. I include *ROA* because management is willing to disclose their information truly while a firm's performance is stronger and healthy (Xu and Tang, 2009). Thus, I expect that *ROA* is positively related to public information precision. I include *Lev* as a control variable since firm with higher leverage have less accurate forecasts (Xu and Tang, 2009), and thus have lower information precision.

I also include *Growth* in these regressions although empirical evidence regarding its effect on analysts' accuracy and bias is mixed (Ajinkya et al., 2005; Dechow and Sloan, 1997). I do not expect the sign of the coefficient on *Growth*. *Loss* is included since there is a negative correlation between information precision and previous loss (Mohanram and Sunder, 2006). I thus posit that public information precision is lower in the presence of previous loss. Finally, since the volatility (*Stdroe*) is likely to affect analysts' ability to forecast a firm's earnings and their forecast characteristics (Lang and Lundholm, 1996; Behn et al. 2008), I expect this control variable is negatively related to public information precision.

Thus far, I focus on control variables used in public information precision tests.

For private information precision test, I include the same set of control variables as those used in equation (1). As mentioned previously, since there are two opposite arguments about the effect of ICW on private information precision, I do not predict the signs of all control variables in equation (2). I also include year and industry dummies in all of the regressions to control the year effect and industry effect.

3.1.2 The impact of severity of internal control weakness on information precision

In order to test Hypothesis 2 that there are differential effects on information precision among firms with different types of internal control weaknesses, I classify internal control weaknesses as either account-specific or firm-level weaknesses. The classification of firm-level and account-specific weaknesses is similar to Moody's classification scheme (Moody's, 2006, 2007; Doyle et al., 2007a). I expect that firm-level weaknesses will be more strongly related to information precision. The regressions testing the impact of the severity of internal control problems on information precision are as follows:

$$RPUBLIC_{i,t}=c_0+c_1ICW\_acc_{i,t}+c_2ICW\_firm_{i,t}+c_3Big4_{i,t}+c_4Opinion_{i,t}+c_5Horizon_{i,t}+c_6Size_{i,t}$$
$$+c_7Sprise_{i,t}+c_8ROA_{i,t}+c_9Lev_{i,t}+c_{10}Growth_{i,t}+c_{11}Loss_{i,t}+c_{12}Stdroe_{i,t}+\varepsilon \qquad (3)$$
$$RPRIVATE_{i,t}=d_0+d_1ICW\_acc_{i,t}+d_2ICW\_firm_{i,t}+_+d_3Big4_{i,t}+d_4Opinion_{i,t}+d_5Horizon_{i,t}$$
$$+d_6Size_{i,t}+d_7Surprise_{i,t}+d_8ROA_{i,t}+d_9Lev_{i,t}+d_{10}Growth_{i,t}+d_{11}Loss_{i,t}+d_{12}Stdroe_{i,t}+\varepsilon$$
$$(4)$$

Independent variable

ICW_acc = 1 if the firm discloses account-specific material weaknesses in internal control, and 0 otherwise. Following prior studies (Moody's, 2006, 2007; Doyle et al., 2007a), account-specific weaknesses are defines as the internal control issues that relate to internal control over specific account balances or transaction-level processes.

ICW_firm = 1 if the firm discloses firm-level material weaknesses in internal control, and 0 otherwise. Following prior studies (Moody's, 2006, 2007; Doyle et al., 2007a), firm-level weaknesses are defined as the internal control

issues that relate to company overall controls, such as an ineffective control environment, weak financial reporting processes, or ineffective personnel.

To test Hypothesis 2 that firm-level control weaknesses have a stronger association with information precision than account-specific control weaknesses, I search 10-Ks in the EDGAR from November 2004 to December 2007 to classify firms into two categories: firms with firm-level weaknesses and firms with account-specific weaknesses. Following the classification of Moody's (2006; 2007) and Doyle et al. (2007a; 2007b) (see Appendix), I consider this firm as an ICW firm with firm-level weaknesses if a firm both has account-specific and firm-level weaknesses.

3.1.3 The impact of ICW firms with remediation

To explore Hypothesis 3 that whether remediation firms exhibit an increase in public and private information precisions relative to non-remediation firms, I follow Ashbaugh-Skaife et al. (2008) and perform the following regressions:

$$RPUBLIC_{i,t}=m_0+m_1Weakness_{i,t}+m_2Remediation_{i,t}+m_3Big4_{i,t}+m_4Opinion_{i,t}$$
$$+m_5Horizon_{i,t}+m_6Size_{i,t}+m_7Surprise_{i,t}+m_8ROA_{i,t}+m_9Lev_{i,t}+m_{10}Growth_{i,t}$$
$$+m_{11}Loss_{i,t}+m_{12}Stdroe_{i,t}+\varepsilon \qquad (5)$$
$$RPRIVATE_{i,t}=n_0+n_1Weakness_{i,t}+n_2Remediation_{i,t}+n_3Big4_{i,t}+n_4Opinion_{i,t}+n_5Horizon_{i,t}$$
$$+n_6Size_{i,t}+n_7Surprise_{i,t}+n_8ROA_{i,t}+n_9Lev_{i,t}+n_{10}Growth_{i,t}+n_{11}Loss_{i,t}$$
$$+n_{12}Stdroe_{i,t}+\varepsilon \qquad (6)$$

Weakness is an indicator variable which equals one if the firm received an adverse SOX 404 opinion in the current or prior year, and zero otherwise. *Remediation* is an indicator variable that takes value of one if the firms received an adverse SOX 404 opinion in the current year, but received an unqualified SOX 404 opinion in

successive years. *Remediation* captures the incremental effect of the remediation for ICW firms that previously received an adverse opinion, but resolved internal control problems in successive years. To be consistent with these predictions, I expect the coefficient on *Weakness* to be negative and the coefficient on *Remediation* to be positive in equation (5) and do not expect the directions of the coefficients on *Weakness* and *Remediation* in equation (6).

3.2 Sample selection

I obtain the initial sample of 12,459 that filed first-time Section 404 reports between November 2004 and December 2007 from the *Audit Analytics* database. This sample comprises 1,361 observations with ineffective internal control and 11,098 observations with effective internal control. The financial statement data are retrieved from *COMPUSTAT North America* database. The variables related to analysts' behavior, such as analyst following, horizon, and analyst information precision are retrieved from *I/B/E/S* database. Following Doyle et al. (2007a) and Ashbaugh-Skaife et al. (2007), I use the overall non-material internal control weakness population as the control group, rather than a matched sample, to eliminate choice-based sample bias[11].

The sample selection procedure and its effect on sample size are described in Table 1. First, I delete 2,903 observations without analyst forecast information. Second, I exclude 3,044 observations due to insufficient financial data. This selection procedure yields 6,512 firm-year observations for my information precision analyses

---

[11] Cram and Karan (2009) suggest that the analysis of matched samples can occur technical errors, such as use of unconditional analysis, failure to control for effect of imperfectly matched variables, and non proportionally sample representative. They demonstrate with simulated data how incorrect analysis in a choice-based matched-sample setting can lead to incorrect inferences. The simulations demonstrate that incorrect analysis may (1) fail to detect significant true effects, (2) find false significant effects, and (3) find significant results that are opposite in sign to the true effects.

including 546 observations with weak internal control. To classify 546 observations into two categories, i.e., account-specific or firm-level weaknesses, I search SEC 10-Ks in the EDGAR from November 2004 to December 2007. Of 546 firms-year observations with non-missing data, 361 observations are classified as account-specific and 185 observations as firm-level weaknesses.

Table 1
Sample selection

Number of company-years during 2004-2007 period	12,459
Less: Non analyst forecast firms	(2,903)
Less: Missing financial data	(3,044)
Total sample for analysts' information precision	6,512

4. Empirical Results

4.1 Univariate Analyses

Table 2 presents the descriptive statistics for the variables on which the analyses are based, tabulated by ICW firm and non-ICW firms. The table also presents the results of statistics analyses from t-tests and Wilcoxon Z-tests for difference in means and medians between the two types of firms.

As shown in Table 2, the mean (median) values of the proxy for the precision of public information, *RPUBLIC*, for ICW firms and non-ICW firms are 715.70 (647) and 826.17 (793), respectively. As predicted, the mean and median values of *RPUBLIC* for ICW firms are significantly smaller than those for non-ICW firms. Similarly, the mean (median) value of the precision of private information for ICW firms 653.51(588) is also significantly smaller than that for non-ICW firms 790.48(760).

Regarding the control variables, most of non-ICW firms are audited by Big 4

(91%), and the percentage of non-ICW firms audited by Big 4 is significantly larger than that of ICW firms audited by Big 4 (87%). I also find that ICW firms have larger firm size, negative surprise, poor profitability, previous loss, higher leverage, lower opportunity of growth and more volatility relative to non-ICW firms.

Table 2
Descriptive statistics of the variables

	Non-ICW firms			ICW firms			
	Mean	Median	Predicted Difference	Mean	Median	t-test of Mean	z-test of Median
RPUBLIC	826.17	793	>	715.70	647	5.87***	4.84**
RPRIVATE	790.48	760	>	653.51	588	4.80***	6.06***
Big4	0.9177	1		0.8704	1	3.77***	3.59***
Opinion	0.5321	1		0.6019	1	-3.12***	-3.07***
Horizon	50.4345	53		48.3815	51	1.60	1.39
Size	7.7519	7.6394		7.0232	6.7156	8.70***	9.62***
Surprise	0.2311	0.1055		-0.6921	-0.1784	1.03	7.43***
ROA	0.0380	0.0493		0.0108	0.0181	4.24***	10.38***
Loss	0.1499	0		0.3315	0	-11.03***	-10.90***
Lev	0.5673	0.5639		0.5456	0.5267	1.81*	2.12**
Growth	4.3020	2.4137		3.1962	2.2725	0.68	2.43**
Stdroe	0.4662	.08295		0.6083	0.1579	-1.07	-8.98***

a. Variable definition

RPUBLIC	=	the rank value of precision of public information from analysts,
RPRIVATE	=	the rank value of precision of private information from analysts,
ICW	=	1 if the firm discloses material weakness in internal control under Section 404, and 0 otherwise.
Big4	=	1 if auditor is Big4, and 0 otherwise;
Opinion	=	1 if a firm reveals clean opinion and 0 otherwise;
Horizon	=	the period between analyst forecast date and financial reporting date;
Size	=	logarithm of assets, measured at the end of fiscal year t-1;
Surprise	=	(net income in current year- net income in last year)/net income in last year;
ROA	=	the ratio of return to asset, calculated as earnings before extraordinary items scaled by average total assets;
Lev	=	the ratio of debt to averaged total assets;
Growth	=	market value of equity divided by book value of equality;
Loss	=	1 if last firm-year observation revealed negative earnings, and 0 otherwise;
Stdroe	=	standard deviation of return of equity over the previous five years;

b. ***, **, * Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

Panel A of Table 3 reports the characteristics of quintile portfolios formed by public information precision. Consistent with the "*complementary*" perspective (Kim and Verrecchia, 1991, 1994; Lundholm, 1995), Panel A of Table 3 reveals that there is evidence of a strong positive relation between public and private information precisions. The mean value of private information precision, *RPRIVATE*, falls from 1187.71 for the highest *RPUBLIC* portfolio to 467.19 for the lowest *RPUBLIC* portfolio. More importantly, I find that the firms with greater public information precision are less likely to disclose internal control weaknesses, consistent with my prediction. The mean values of *ICW* are 0.0718 and 0.0981, respectively, for the highest and lowest *RPUBLIC* portfolios, and the difference is significant at 5 percent level.

To provide further insights into whether firm-level ICW have a relatively stronger effect on public information precision, I further partition ICW firms into firms with account-specific weaknesses and firms with firm-level control weaknesses. Panel A of Table 3 further shows that the percentage of firm with firm-level weaknesses for the highest *RPUBLIC* portfolio is significant lower than that of firms with firm-level weaknesses for the lowest *RPUBLIC* portfolio, while there is no significant difference in percentage of firms with account-specific ICW between the highest and the lowest *RPUBLIC* portfolios. These results is consistent with Doyle et al. (2007b), who find that only those firms with firm-level material weaknesses, rather than more auditable, account-specific weaknesses, have lower information quality.

Similar to Panel A, Panel B of Table 3 displays the characteristics of quintile portfolios formed by private information precision. As in Panel B, private information precision is strongly and negatively association with ICW firms and positively related to public information precision. In addition, firms with greater private information precision are less likely to have internal control weaknesses. However, the primary

difference between Panel A and B is that there are significantly negative differences in percentage of firms with account-specific and firm-level weaknesses between the highest and the lowest *RPRIVATE* portfolios. In contrast, for public information tests, the association between ICW and public information precision is primarily attributable to firm-level weaknesses, as evidenced by Panel A. I will discuss this difference in more detail later.

Table 3

Panel A: Average rank of private information precision and control weaknesses by firm category: from large to small public information precision					
Size	*RPUBLIC*	*RPRIVATE*	*ICW*	*IC_acc*	*IC_firm*
Large	Q5	1187.71	0.0718	0.0491	0.0227
	Q4	944.05	0.6732	0.0483	0.0249
	Q3	726.87	0.0740	0.0549	0.0205
	Q2	572.27	0.0755	0.0549	0.0256
Small	Q1	467.19	0.0981	0.0571	0.0418
Diff.	Q5-Q1	720.52***	-0.0263**	-0.0080	-0.0191***
Panel B: Average rank of public information precision and control weaknesses by firm category: from large to small private information precision					
Size	*RPRIVATE*	*RPUBLIC*	*ICW*	*IC_acc*	*IC_firm*
Large	Q5	1228.8340	0.0594	0.0432	0.0168
	Q4	976.3692	0.0623	0.0454	0.0176
	Q3	767.0732	0.0747	0.0483	0.0271
	Q2	589.8829	0.0857	0.0520	0.0351
Small	Q1	525.1818	0.1144	0.0755	0.0389
Diff.	Q5-Q1	703.6525***	-0.0550***	-0.0323***	-0.0220***

a. Variable definition

RPUBLIC	=	the rank value of precision of public information from analysts,
RPRIVATE	=	the rank value of precision of private information from analysts,
ICW	=	1 if the firm discloses material weakness in internal control under Section 404 and 0 otherwise.
IC_acc	=	1 if the firm discloses account-specific control weaknesses under Section 404 and 0 otherwise.
IC_firm	=	1 if the firm discloses firm-level control weaknesses under Section 404 and 0 otherwise.

b. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

Table 4 presents the results of Pearson correlation for the sample of information precision. The results reveal that the dummy variable for internal control weakness (*ICW*) is negatively associated with the public (*RPUBLIC*) and private (*RPRIVATE*) information precisions. This evidence provides preliminarily supporting evidence of my hypotheses. Moreover, *RPUBLIC* and *RPRIVATE* are highly positively correlated (0.5260). This finding is consistent with prior evidence of a complementary association between public and private information precisions. It also can be seen that the firms with smaller auditor size (*Big4*), smaller firm (*Size*), less profitability (*ROA*), and loss in previous year (*Loss*) have higher possibility of occurring internal control problems.

In summary, all the univariate analyses provide preliminary evidence supporting the hypotheses that internal control weaknesses lead to less precisions of public and private information contained in analysts' earnings forecasts. I will examine the effect of internal control weaknesses on the precisions of public and private information after controlling for other variables documented to be associated with information precision in the following multivariate analyses.

Table 4
Pearson correlation matrix

	RPUBLIC	RPRIVATE	ICW	Big4	Opinion	Horizon	Size	Surprise	ROA	LEV	Growth	Loss	Stdroe
RPUBLIC	1												
RPRIVATE	0.5260***	1											
ICW	-0.0581***	-0.0709***	1										
Big4	-0.1161***	-0.0407***	-0.0434***	1									
Opinion	0.0445***	0.0727***	0.0371***	0.0760***	1								
Horizon	-0.0022	-0.0183	-0.0221*	-0.0127	-0.0270**	1							
Size	-0.1607***	-0.0640***	-0.1035***	0.2396	0.0598***	0.0096	1						
Surprise	0.0266**	0.0185	-0.0129	-0.0401***	-0.0081	0.0011	-0.0094	1					
ROA	0.0912***	0.0902***	-0.0513***	0.0486***	-0.0035	0.0240**	0.2012***	-0.0067	1				
Lev	-0.1053***	-0.0983***	-0.0223*	0.0236*	0.0034	0.0144**	0.4343***	-0.0020	-0.1277***	1			
Growth	0.0218*	0.0260**	-0.0083	0.0150	0.0192	0.0042	-0.0348***	0.0053	0.0071	0.0316**	1		
Loss	-0.1350***	-0.1180***	0.1319***	-0.0614***	0.0447***	-0.0329***	-0.2765***	-0.0062	-0.6428***	0.0117	0.0194	1	
Stdroe	0.0042	-0.0262**	0.0134	-0.0003	0.0135	-0.0107	-0.0578***	-0.0149	-0.0376***	0.0818***	0.1111***	0.0680***	1

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

b. See Table 2 for the definitions of all variables.

4.2 Regression Results

4.2.1 Multivariate analysis of information precision and control weaknesses

Table 5 presents summary results of estimating regression in equations (1) and (2). As shown in column (1) of Table 5, the coefficient of *ICW* is negative and statistically significant (coef.= -79.2844; p< 0.01), consistent with Hypothesis 1a, indicating that the precision of public information is lower for ICW firms relative to non-ICW firms. Similar to prior studies (Kinney, 2000; Ashbaugh-Skaife et al., 2008), this essay provides evidence that internal control weaknesses result in more bias and errors in analysts' forecasts and in turn lower public information precision contained in analysts' earnings forecasts.

Regarding the control variables, as predicted, the coefficients on firm size (*Size*), financial leverage (*Lev*) and whether firms reported losses in prior year (*Loss*) are significant in the expected directions. However, the coefficient of *Big4* is negatively related to the precision of public information, contrary to my prediction. Louis (2005) suggests that non-Big 4 auditors are likely to have comparative advantages, because of their superior knowledge of the local markets and connections with their clients. Thus, this result is consistent with Chang et al. (2009), who find that Big 4 audit firms in some areas, such as productivity growth and technical progress, underperform non-Big 4 auditors. The coefficient on *Surprise* is positively associated with public information precision, consistent with Hope (2003b), who suggests that firms with more positive earnings in the current year can reduce analysts' forecast dispersion and error. The coefficient on *Growth* is significantly positive at the 6.5% level, consistent with Ajinkya et al. (2005), who find that high growth firms likely issue more accurate and less optimistically biased forecasts

As revealed in column (2) of Table 5, the coefficient on *ICW* is significantly negative (coef. = -92.0755; p < 0.01), suggesting that ICW firms is negatively related

to private information precision contained in analysts' forecasts. This finding is consistent with Hypothesis 1b. Turning to the control variables, the column (2) of Table 5 shows the coefficient (-143.0284) of *Lev* is significantly negative, indicating that firms with higher leverage tend to have less precise private information. The coefficient (0.3784) on *Growth* is positively related to private information precision at the 1% level, suggesting that analysts tend to develop more accurate private information in deriving earnings forecasts for higher-growth firms. Consistent with my prediction, the coefficient (-151.4089) on *Loss* is significant in the expected directions, indicating that when issuing earnings forecasts for firms with previous loss, analysts on average have lower precision of private information. However, the coefficient on *Surprise* is positively related to private information precision, indicating that analysts have more accurate private information for the firms with more positive earnings in the current year than those in the last year (Hope, 2003b).

Moreover, I control the effect of public information precision on private information precision in equation (2). The result in column (3) of Table 5 shows that the coefficient on *ICW* is negatively related to private information precision (coef.= -85.7463, p=0.0110) after controlling the effect of public information precision. The coefficient on public information precision is positively associated with private information precision (coef.= 0.4374, p<0.01), indicating that public and private information precisions may act as a complementary effect, consistent with the finding of Lundholm (1988). This evidence is also in line with one stream of research that a public release of information triggers analysts to generate more accurate private information from the public announcement (i.e., Kim and Verrecchia, 1994, 1997; Barron et al., 2002).

In sum, the above result suggests that ineffective internal control system not only results in more forecast dispersion and error, as evidenced by prior studies (Kim et al.,

2008; Xu and Tang, 2009), but also adversely affects the information precision contained in analysts' earnings forecasts, regardless of public and private information, which is a mirror of investors' information quality in the capital market.

Table 5
Information precision and internal control weaknesses

	Equation (1): *RPUBLIC*		Equation (2): *RPRIVATE*		Equation (2): *RPRIVATE*	
	Coef.	P value	Coef.	P value	Coef.	P value
Intercept	609.2685	0.0000***	498.0459	0.0370**	231.1995	0.2680
ICW	-79.2844	0.0000***	-92.0755	0.0000***	-85.7643	0.0110**
RPUBLIC					0.4374	0.0000***
*PRUBLIC*ICW*					0.0391	0.3720
Big4	-95.6467	0.0000***	-18.5406	0.4290	23.4917	0.2650
Opinion	9.2648	0.4560	16.9130	0.1990	12.8862	0.2680
Horizon	0.02914	0.8740	-0.312715	0.1060	-0.3204	0.0690*
Size	-36.0811	0.0000***	-3.53586	0.3920	12.3549	0.0010***
Surprise	0.51275	0.0040***	0.396654	0.0310**	0.1739	0.2160
ROA	71.2812	0.2210	45.1894	0.4270	14.0007	0.7820
Lev	-80.0228	0.0010***	-143.0284	0.0000***	-107.2928	0.0000***
Growth	0.2912	0.0010***	0.3784	0.0110**	0.2510	0.0820*
Loss	-203.6231	0.0000***	-151.4089	0.0000***	-61.5699	0.0010***
Stdroe	1.5484	0.4270	-1.5147	0.5810	-2.1773	0.4050
N	6512		6512		6512	
R-square	0.2536		0.1936		0.3352	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.
b. See Table 2 for the definitions of all variables.

4.2.2 The impact of ICW on overall information environment

Thus far, the results focus exclusively on the impact of ICW on the precisions of public and private information, respectively. To provide further insights into whether and how weak internal controls influence the overall information environment, I follow Barron et al. (1998) and define overall information uncertainty,

UNCER, as follows:

UNCER$_{i,t}$ = fractional rank of *uncertainty* for firm i, year t. *Uncertainty* is drawn from

Barron et al. (1998) and can be defined as follows: $\dfrac{1}{PUBLIC_{i,t} + PRIVATE_{i,t}}$

where *Uncertainty* represents a lack of precision in individual analysts' total information, as a proxy for overall information environment, which contains public and private information precisions. Prior studies show that estimated measures of public and private information precisions are heavily skewed to the right (Gu, 2004; Botosan et al., 2004), I thus follow Botosan et al. (2004) and use fractional ranks of *Uncertainty* in the following equation. As shown by the definition of *Uncertainty*, the lower level of public (or private) information precision implies a higher level of uncertainty. I use the following regression to explore the impact of ICW on overall information environment.

$$UNCERi,t = f_0 + f_1 ICW_{i,t} + f_2 Big4_{i,t} + f_3 Opinion_{i,t} + f_4 Horizon_{i,t} + f_5 Size_{i,t} + f_6 Surprise_{i,t}$$
$$+ f_7 ROA_{i,t} + f_8 Lev_{i,t} + f_9 Growth_{i,t} + f_{10} Loss_{i,t} + f_{11} Stdroe_{i,t} + \varepsilon \qquad (7)$$

As shown in column (1) of Table 6, as predicted, the coefficient of *ICW* is significantly positive at one percent level, indicating that there is a greater level of uncertainty among firms with material internal control weaknesses. The results, coupled with those in Table 5, suggest that weak internal controls adversely affect public and private information precisions, respectively, and in turn increase information uncertainty contained in analysts' forecasts, at least in terms of overall information environment.

To provide further insights into the effect of reduced information environment quality due to internal control weaknesses, I further examine whether ICW firms have

less number of analyst following than non-ICW firms by replacing independent variable, *UNCER*, with a proxy for analyst following, *ANA_FOLLOW*, in equation (7). Since prior studies (e.g., Lang and Lundholm 1996; Roulstone, 2003) document well that firms with more informative disclosure policies have a larger analyst following, I predict that the coefficient of *ICW* is negative. As revealed in column (2) of Table 6, I find that, consistent with my prediction, the coefficient of *ICW* is significantly negative to analyst following, suggesting that internal control weaknesses leads to a smaller analyst following.

However, analysts' uncertainty and following might be affected by the inner corporate characteristics, such as corporate structure, rather than internal control system. In order to avoid the confounding effect, I use 2-stage treatment effect model to control for potential self-selection bias related to a firm's choice of internal control system. At the first stage, I control the firms' market value of equity, profitability, financial error, the change of auditor, the change of organization, the foreign sales of the firms operations, and corporate governance. The sample for first-stage analysis is reduced to 4,935 observations because I only consider the firms with disclosure of governance information.

The results in column (3) and (4) in Table 6 show that weak internal control results in more analyst' uncertainty (coef.=30.1781, p<0.01, two-tailed) and less analyst following (coef.=-0.9467, p=0.104, one-tailed) after controlling the confounding effect. Thus, internal control weaknesses not only impact public and private information contained in analysts' forecast, but also analysts' information uncertainty and following, proxied as overall information environment in the capital market..

37

Table 6

Results from regression of uncertainty and analyst following on ICW firms

	Original model				Controlling the confounding effect			
	UNCER		ANA_FOLLOW		UNCER		ANA_FOLLOW	
	(1)		(2)		(3)		(4)	
	Coef.	P value	Coef.	P value	Coef.	P value	Coef.	P value
Intercept	- 130.2230	0.0000***	- 3.1881	0.0000***	-78.7852	0.0000***	-9.5652	0.0000***
ICW	6.8890	0.0010***	- 0.5444	0.0030***	30.1781	0.0000***	-0.9467	0.1040*
Big4	3.6723	0.0480**	- 0.3838	0.0070***	2.5352	0.3000	-0.5961	0.0270**
Opinion	- 1.2706	0.3170	0.3472	0.0070***	2.7056	0.0610*	0.3963	0.0120**
Horizon	0.0179	0.3150	0.0020	0.2890	0.0288	0.1850	0.0058	0.0140**
Size	3.3814	0.0000***	1.1756	0.0000***	2.9541	0.0000***	1.2721	0.0000***
Surprise	- 0.0386	0.0090***	- 0.0006	0.6400	- 0.0421	0.1220	-0.0009	0.7510
ROA	- 2.1704	0.6860	1.2945	0.0060***	- 46.7026	0.0000***	0.8264	0.2080
Lev	9.9948	0.0000***	- 4.2303	0.0000***	12.0029	0.0000***	-5.3075	0.0000***
Growth	- 0.0411	0.0010***	0.0011	0.0600*	- 0.0233	0.2730	0.0020	0.3790
Loss	23.6403	0.0000***	0.3973	0.0150**	0.1739	0.4790	0.0132	0.6240
Stdroe	- 0.0697	0.7110	0.0104	0.5550	30.1781		0.0132	0.2480
N	6512		6512		4935		4935	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

b. See Table 2 for definitions of all variables.

4.2.3 Multivariate analysis of information precision and the severity of weaknesses

In this section, I further examine whether there are differential effects on the precisions of public and private information between firms with account-specific weaknesses and those with firm-level weaknesses. Table 7 displays summary results of estimating regressions in equations (3) and (4).

Column (1) of Table 7 reveals that the coefficients of account-specific (IC_acc) and firm-level (IC_firm) weaknesses are both significantly and negatively associated with public information precision (c_1 = -58.7947, c_2=-128.3434, respectively). Consistent with my prediction, F-test further shows that there is significant differences in the coefficients for IC_firm and IC_acc (F=3.05, p= 0.0807, two-tailed), indicating that there are differential effects on public information precision among

ICW firms, and the negative association between ICW and public information precision is stronger for firms with firm-level weaknesses than for those with account-specific weaknesses.

Regarding the private information, similar to the result of column (1), the column (2) of Table 7 shows that the coefficients of *IC_acc* and *IC_firm* are negatively related to private information precision at the 1% level (d_1 = -81.2436, d_2=-108.3964, respectively), but there are not significant differences in these coefficients under an F-test (F=0.45, p= 0.5037, two-tailed). One possible explanation for the result is that since private information reflects the idiosyncratic information individual analysts rely on and is defined as informed judgments (Kim and Verrecchia, 1994), any "material" internal control weaknesses disclosure, irrespective of account-specific or firm-level weaknesses, has equally significant effect on the precision of private information. In contrast, since public information in the mean forecast primarily reflects the common information all analysts observe and rely upon, there is differential effect on the public information precision between account-specific and firm-level weaknesses.

In sum, these results provide further evidence that material internal control weaknesses are associated with lower level of public and private information precisions, regardless of account-specific and firm-level control weaknesses. In addition, firm-level weaknesses have a more negative effect on public information precision than account-specific weaknesses, while there are no differential effects on private information precision between firms with firm-level weaknesses and with account-specific weaknesses. Furthermore, in terms of overall information environment, untabulated results show that firms with firm-level weaknesses are likely to lead to reduce analysts' information uncertainty.

Table 7
Information precision and the severity of internal control weaknesses

	Dependent variable=	Equation (3): RPUBLIC		Equation (4): RPRIVATE	
	Predicted sign	Coef.	P value	Coef.	P value
Intercept	+/-	609.1147	0.0000***	497.7454	0.0080***
IC_acc	-	- 58.7947	0.0120**	- 81.2436	0.0010***
IC_firm	-	- 128.3434	0.0000***	- 108.3964	0.0020***
Big4	+	- 96.8821	0.0000***	- 18.9593	0.3720
Opinion	+	9.8735	0.4280	17.1197	0.1990
Horizon	-	0.0285	0.8760	- 0.3121	0.1110
Size	+/-	- 35.9496	0.0000***	- 3.4600	0.3930
Surprise	-	0.5176	0.0030***	0.3992	0.1410
ROA	+	72.2387	0.2150	45.4299	0.3980
Lev	-	- 79.7252	0.0010***	- 143.1893	0.0000***
Growth	+/-	0.2914	0.0010***	0.3787	0.0160**
Loss	-	- 202.4587	0.0000***	- 151.1381	0.0000***
Stdroe	-	1.5058	0.4410	- 1.5327	0.5020
ICW_firm>ICW_acc		F=3.05	0.00807*	F=0.45	0.5037***
N		6512		6512	
R-square		0.2541		0.1828	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

b. See Table 2 and 3 for the definitions of all variables.

4.2.4 Multivariate analysis of information precision and remediation

The results reported thus far indicate that ICW firms have lower precisions of public and private information. In this section, I further examine whether firms whose auditors confirm remediation of previously reported internal control weaknesses have higher information precision than firms who do not remedy their weaknesses. Table 8 provides the summary results of regressing information precision on remediation and other control variables documented well to be related to control weaknesses.

As shown in Table 8, the coefficients on *Remediation* are significantly and positively associated with public and private information precisions (m_2 =116.6319, p<0.01; n_2 =145.5074, p<0.01), respectively, indicating that ICW firms which remedy

their internal control problems have higher levels of the precisions of public and private information than ICW who fail to remedy those problems. The results are in line with the prior studies that ICW firms may become more aggressive to improve their financial process and try to rebuild investors' confidence in the year of remediation (e.g., Ashbaugh-Skaife et al. 2008), and thereby increases the precisions of public and private information, which is a complementary effect. The empirical results provide supporting evidence of Hypotheses 3a and 3b. Moreover, untabulated results show that the level of overall uncertainty is relatively lower for remediation firms relative to ICW firms without improving their control weaknesses.

Table 8
Information precision and remediation

	Predicted sign	Equation (5): *RPUBLIC*		Equation (6): *RPRIVATE*	
		Coef.	P value	Coef.	P value
Intercept	+/-	918.1095	0.0000***	806.5378	0.0000***
Weakness	-	-133.9944	0.0000***	-149.0940	0.0000***
Remediation	+	116.6319	0.0000***	145.5074	0.0000***
Big4	+	-136.2416	0.0000***	-58.6805	0.0140**
Opinion	+	90.2656	0.0000***	97.8500	0.0000***
Horizon	-	-0.0052	0.9790	-0.3474	0.0950*
Size	+/-	-36.1157	0.0000***	-3.5499	0.4130
Surprise	-	0.4751	0.0270**	0.3616	0.0950*
ROA	+	94.1272	0.1200	67.7396	0.2590
Lev	-	-82.4616	0.0020***	-145.7660	0.0000***
Growth	+/-	0.3211	0.0020***	0.4088	0.0070***
Loss	-	-183.6567	0.0000***	-131.8430	0.0000***
Stdroe	-	0.9847	0.6700	-2.0791	0.4870
N		6512		6512	
R-square		0.1862		0.1274	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

b. See Table 2 for the definitions of all variables.

4.3 Further Analyses

4.3.1 Controlling the endogeneity effect

An important concern regarding the specifications (e.g., equation [1] or [2]) is the endogeneity issue. It is possible that firms with low information precision are likely to have material internal control weaknesses for other reasons unrelated to their information precision. If this is the case, I might infer a link between information precision variables and internal control weaknesses when none exists. For example, suppose that:

$$Y = \alpha x + \beta D + e,$$

where D is the dummy variable which equals to one if the firm at least one material weakness in internal control. Because whether firms disclose material internal control is based on various factors, I can use the probit model linking the likelihood of a firm disclosing internal control weaknesses as follows:

$$D^* = \varphi Z + u$$

$$D = 1 \text{ if } D^* > 0, 0 \text{ otherwise.}$$

If the typical firm selects to disclose internal control weakness due to some expected benefit in Y, OLS estimates of β will not correctly measure the effect of internal control weaknesses. This self-selection issue can be handled with a treatment effect model (e.g., see Greene, 2003). To address this potential endogeneity issue, I use a self-selection model that controls for this bias. Specifically, following the prior studies (Doyle et al., 2007a; Ashbaugh-Skaife et al., 2008; Kim et al., 2008), I use the following probit model to predict the presence of internal control weaknesses disclosure:

$$WEAKNESS_{i,t} = \delta_0 + \delta_1 Market_{i,t} + \delta_2 Loss_{i,t} + \delta_3 Restatement_{i,t} + \delta_4 CPA_{CHANGiE_{i,t}}$$
$$+ \delta_5 M\&A_{i,t} + \delta_6 Restructure_{i,t} + \delta_7 Foreign_{i,t} + \varepsilon$$
$$(8)$$

Where *WEAKNESS* denotes the *ex ante* probability of a firm reporting internal control weaknesses that is *ex post* coded one if a firm disclose their control weaknesses under Section 404 and zero otherwise. Prior research has also identified determinants of material weaknesseses in internal control. I include the following variables in the regression: the firms' market value of equity (*Market*), profitability (*Loss*), financial error (*Restatement*), the change of auditor (*CPA_{CHANGE}*), the change of organization, such as restructure, merge or acquisition (*Restructure* or *M&A*), the foreign sales of the firms operations (*Foreign*). Moreover, I also add the quality of corporate governance, such as the percentage of outsider (*Outsider*) and institutional investors (*Institute*), and the independence of audit committee (*AC*), and the index of macroeconomics, such as GDP and personal consumption expenditure (*PCE*) in the first stage. I obtain consistent estimates via full maximum likelihood estimation.

Panel A of Table 9 reveals the estimated results from the two stage treatment effect model. Referring to the first stage, I find that firms with higher market value of equity or firms with merge and acquisition have less control weaknesses. The results also indicate that firms with previous loss, previous restatements, organization change and more complex foreign translation are more likely to have internal control problems. These results are generally similar to previous research (Doyle et al., 2007a; Ashbaugh-Skaife et al., 2008).

It can be seen that, with the selection-bias correction, both coefficients of *ICW* in public and private information analyses are negative and significant, consistent with those in Table 5. The results indicate that the information precision contained in analysts' forecasts is lower for ICW firms than for non-ICW firms, regardless public or private information even after controlling for self-selection bias. As a consequence, overall, after correcting for selectivity bias and controlling for other known factors

related to information precision, these findings are qualitatively unchanged.

4.3.2 The results of change sample

The empirical results reported thus far focus on the cross-sectional relationship between information precision and internal control weaknesses. In this section, I extend the analysis by testing intertemporal changes in public and private information precisions that received SOX 404 opinions in both two years (Ashbaugh-Skaife et al., 2008; Kim et al., 2008). These two-year tests provide a unique setting or establishing a stronger cause-effect relation between information precision and the effectiveness of internal control systems. In addition, the successive year analysis allows me to address the issue of whether the changes in information precision are contemporaneous with change in effectiveness of internal control systems, and to overcome the potential issues arising from correlated omitted variables.

The sample of changing analyses is reduced to 3,385 observations because I only consider the firms with successive year. To assess the influence of an improved control system in ICW firms from year t to t+1 on public or private information precisions, the regression with the reduced sample is as follows:

$$\triangle RPUBLIC \text{ or } \triangle RPRIVATE$$
$$= g_1 Improved + g_2 \triangle Big4 + g_3 \triangle Opinion + g_4 \triangle Horizon + g_5 \triangle Size + g_6 \triangle Surprise + g_7 \triangle Lev + g_8 \triangle Growth + g_9 \triangle Loss + g_{10} \triangle ROA + g_{11} \triangle Stdroe + \varepsilon \qquad (9)$$

Where $\triangle$ refers to the within-firm difference in variables of interest, i.e., the t year value less the t-1 year value. $\triangle RPUBLIC$ ($\triangle RPRIVATE$) is an indicator variable which equals to one if public (private) information precision in successive years is higher than that in previous year, and zero otherwise. All other control variables are as defined previously in equations (1) and (2).

Panel B of Table 9 reports the results of regressions in equation (9). As revealed

in columns (1) and (2), the coefficients on *Improved* are significantly positive at 1% level. It suggests that firms with weak internal control in previous year improving their problems in successive years lead to an increase in public and private information precisions, which is consistent with Hypotheses 4a and 4b. The results provide supporting evidence that changes in public and private information precisions are concurrent with improvement of the internal control systems, indicating that modified internal control systems can raise information quality simultaneously.

In sum, the results shown in Panel B of Table 9 provide supporting evidence that change in effectiveness of internal control systems results in predictable changes in information precision, irrespective of public and private information. In addition, the observed changes in information precision contained in analysts' forecasts are concurrent with changes in the quality of internal controls, which mitigates concerns about possible lag effect between changes to internal controls and when these changes manifest in changes in information precision.

4.3.3 Internal control weakness counts

Most of the prior studies investigating the economic consequence of internal control weaknesses (Ogneva et al., 2007; Chan et al., 2008; Doyle et al., 2007b; Ashbaugh-Skaife et al., 2008) use "whether there are material internal control weaknesses" as the proxy for weak internal control system. However, it is possible that an examination of the effect of Section 404 only by using the indicator variable neglects the differential effect of the frequency of material internal control weaknesses on analysts' information precision. Accordingly, I re-run equations (1) and (2) by replacing the indicator variable, *ICW*, with the count of internal control weaknesses, *NICW*, as a proxy for the extent to which firms have internal control weaknesses.

The results are shown in Panel C of Table 9. The finding indicates that, regardless of public or private information precision analyses, the coefficient of *NICW* is negative and significant at one % level, suggesting that precisions of public and private information decrease with the count of material internal control weaknesses. The results, in conjunction with the findings in Table 5, indicate that the precisions of public and private information are not only relatively lower for firms with material internal control weaknesses, but also decrease with the count of weak controls.

Table 9

Panel A: Results of controlling the endogeneity				
Second stage:	*RPUBLIC*		*RPRIVATE*	
	Coef.	P value	Coef.	P value
Intercept	1527.7460	0.0000***	1217.6660	0.0000***
ICW	- 423.5960	0.0000***	- 365.2330	0.0000***
Big4	- 190.7110	0.0000***	- 91.1758	0.0000***
Opinion	77.2370	0.0000***	97.2291	0.0000***
Horizon	- 0.0850	0.7290	- 0.3953	0.1120
Size	- 53.0559	0.0000***	- 16.6132	0.0010***
Surprise	0.61735	0.0710*	0.4646	0.1810
ROA	467.9665	0.0000***	344.7003	0.0000***
Lev	- 40.4324	0.1800	- 134.3440	0.0000***
Growth	0.2555	0.1940	0.4220	0.0340**
Stdroe	- 1.8446	0.5140	- 4.2500	0.1390
Lambda	163.7962	0.0000***	127.4695	0.0000***
First stage:	Coef.	P value	Coef.	P value
Intercept	-1.8627	0.0000***	-1.7356	0.0120**
Market	0.0000	0.4460	-0.1538	0.0000***
Loss	0.4622	0.0000***	0.3248	0.0000***
Restatement	1.4982	0.0000***	1.4714	0.0000***
CPA$_{change}$	0.1827	0.2580	0.2994	0.1110
M&A	-0.3554	0.0010***	-0.2882	0.0220**
Restructure	0.1328	0.0170**	0.1638	0.0160**
Foreign	0.2601	0.0000***	0.3709	0.0000***

(Table 9 Continued)

Outsider			-0.5131	0.1060
Institute			-0.1019	0.2850
AC			-0.3075	0.2610
GDP			-0.0003	0.9990
PCE			0.8101	0.1310

Panel B: Results of change sample

	△RPUBLIC		△RPRIVATE	
	Coef.	P value	Coef.	P value
Improved	0.4265	0.0060***	0.5944	0.0000***
△*Big4*	- 0.0503	0.8820	- 0.3865	0.2750
△*Opinion*	0.1244	0.0420**	0.1830	0.0030***
△*Horizon*	- 0.0005	0.5670	- 0.0009	0.3160
△*Size*	0.1031	0.4290	0.2583	0.0510*
△*Surprise*	0.0010	0.1740	- 0.0004	0.6190
△*ROA*	0.6080	0.2080	0.9763	0.0440**
△*Lev*	- 0.4932	0.1680	- 0.3173	0.3740
△*Growth*	- 0.0020	0.0480**	0.0007	0.4980
△*Loss*	- 0.3238	0.0070***	- 0.3536	0.0030***
△*Stdroe*	0.0061	0.8990	0.0582	0.1960
N	3385		3385	

Panel C: Results of information precisions on internal control counts

	RPUBLIC		RPRIVATE	
	Coef.	P value	Coef.	P value
Intercept	606.8329	0.0000***	495.1415	0.0380**
NICW	-24.3595	0.0010***	-27.9467	0.0000***
Big4	-97.9051	0.0000***	-21.0888	0.3700
Opinion	8.5425	0.4920	16.0247	0.2240
Horizon	0.0183	0.9200	-0.3249	0.0920*
Size	-35.5352	0.0000***	-2.8978	0.4830
Surprise	0.5203	0.0030***	0.4054	0.0250**
ROA	70.8868	0.2240	44.6342	0.4340
Lev	-79.5443	0.0010***	-142.5329	0.0000***
Growth	0.2928	0.0010***	0.3804	0.0110**
Loss	-203.6178	0.0000***	-151.5216	0.0000***
Stdroe	1.5207	0.4380	-1.5456	0.5730

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

b. See Table 2 for the definitions of all variables.

4.3.4 Controlling fixed effect and random effect for panel data

I use a fixed effect and a random effect model to test the presence of serial correlation due to panel data as suggested by Greene (2003). As shown in Panel A and Panel B of Table 10, similar to previous results, these findings suggest that weak internal controls still have a negative impact on analysts' information precision, regardless of public or private information precisions after controlling fixed or random effect. Furthermore, Hausman test is used to see if the significance of parameter estimatation is consistent between fixed and random effect models. The statistical results shows that Chi^2 = 501.67 (P<0.01) in Panel A and Chi^2=373.01 (P<0.01) in Panel B, indicating that the deviation between fixed and random effect models is significant. Given the panel data, I conducted a sensitivity analysis and repeated the tests after controlling fixed effect and random effects. Those results are similar to the prior analysis and qualitatively robust.

Table 10
Results of controlling fixed effect and random effect

Panel A: The results of testing Equation (1)				
	RPUBLIC			
	Fixed effect		Random effect	
	Coef.	P value	Coef.	P value
Intercept	1341.5120	0.0000***	1355.1680	0.0000***
ICW	- 59.3923	0.0040***	- 114.8379	0.0000***
Big4	- 94.2964	0.0000***	- 158.2608	0.0000***
Opinion	- 4.4690	0.7180	82.1135	0.0000***
Horizon	- 0.1308	0.4960	- 0.11887	0.5610
Size	- 45.7616	0.0000***	- 46.3650	0.0000***
Surprise	0.4001	0.1370	0.4317	0.1310
ROA	8.8401	0.8610	25.9291	0.6290
Lev	- 51.082	0.0310**	- 40.3166	0.1080
Growth	0.3071	0.0460	0.2872	0.0790*
Loss	- 244.7597	0.0000***	- 244.1907	0.0000***

(Table 10 Continued)

Stdroe	0.5863	0.7920	- 0.2737	0.9080
N	6512		6512	
Chi²		F=501.67***		

Panel B: The results of testing Equation (2)

	RPRIVATE			
	Fixed effect		Random effect	
	Coef.	P value	Coef.	P value
Intercept	1034.4340	0.0000***	1048.0170	0.0000***
ICW	- 72.0619	0.0010***	- 126.3205	0.0000***
Big4	- 16.4792	0.4300	- 78.8891	0.0000***
Opinion	16.1551	0.2070	98.5249	0.0000***
Horizon	- 0.3870	0.0520*	- 0.3767	0.0730*
Size	- 15.235	0.0000***	- 15.7542	0.0000***
Surprise	0.3325	0.2320	0.3548	0.2260
ROA	16.7777	0.7480	33.7657	0.5400
Lev	- 127.1183	0.0000***	- 116.0880	0.0000***
Growth	0.4181	0.0090***	0.4015	0.0170**
Loss	- 175.5024	0.0000***	- 174.1563	0.0000***
Stdroe	- 1.7097	0.4570	- 2.6012	0.2830
N	6512		6512	
Chi²		F=373.01***		

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

b. See Table 2 for the definitions of all variables.

5. Conclusion

The purpose of this essay is to investigate the effects of firms' internal control weaknesses on public and private information precisions contained in analysts' earnings forecasts. I measure public and private information precisions are drawn from Barron et al. (1998) and Botosan et al. (2004), who use the precisions of public and private information contained in analysts' earnings forecasts as proxies for the quality of investors' information sets. I identify firms with internal control as those that disclosed a control weakness from November 2004 to December 2007 under

Sections 404 Act.

When a firm has weak internal control environment and systems, there is uncertainty and unreliability on analysts' earnings forecasts. Thus I posit that ICW firms have greater information asymmetry and lead to less precise information from analysts. Besides, I partition the sample based on the description of each internal control weakness found in the SEC filing. I further classify control weaknesses as account-specific or firm-level to investigate the impact of the severity of control weaknesses. Moreover, I consider the effect of improved ICW firms on analysts' information precision.

After controlling for a variety of innate firm characteristics that prior research shows to be associated with analyst forecast behavior, I find ICW firms exhibit greater noise in revealing information and more bias and errors in analysts' earnings forecasts relative to non-ICW firms. Thus, ICW firms have less precise public and private information contained in analysts' forecasts and lower level of overall information environment relative to non-ICW firms. In the second test, firm-level control weaknesses lead to lower the level of public information precision than account-specific control weaknesses. Thus, I suggest that firm-level control weaknesses are more serious than account-specific weaknesses. Finally, ICW firms with remediation in following year will increase information precision relative to ICW firms without remediation. This evidence is support my hypothesis that if firms improve their control system and receive unqualified SOX 404 audit opinion in successive years, they will raise their information quality and reduce information uncertainty.

In sum, the results of this essay support that information precision contained in analysts' forecasts will be affected by weak internal control, because ICW firms lack capabilities or resources to effectively control firms' transaction process, and hence

lead to noisier analysts' public and private information precisions, and in turn reduce the level of overall information environment. However, an effective improvement of weak controls offers positive economic benefits for ICW firms that can help ICW firms reduce information asymmetry and enhance information precision and thereby reduce the level of information uncertainty.

Ⅲ. Internal Control Weaknesses, Information Asymmetry and Market Liquidity

Ⅰ. Introduction

The primary objective of this essay is to investigate the association between internal control weaknesses and market liquidity, which is measured by bid-ask spreads. This essay examines the reaction of market specialists to internal control reporting as a proxy for the overall market reaction at the time when SOX 404 opinions are announced. It is posited that market specialists adjust the extent of the adverse selection problem[12] related to a stock by observing how accurate information is disclosed (Chung et al. 1995). Recent studies have examined the impact of public information disclosure on information asymmetry and market liquidity. These studies explore trading activity and market liquidity around specific events and find that market specialists will adjust their bid and ask price when the information environment changes (Lee et al., 1993; Yohn, 1998; Libby et al., 2002).

Section 404 Act requires public companies to disclose management's assessment of internal controls and effectiveness of internal controls in their annual reporting. The disclosure of material weaknesses may lead to market participants question about the remediation expenses and the possibility of misstatement errors over financial reporting. Previous research finds that market returns are significantly negative on the day that the weaknesses are disclosed (Hammersley et al., 2007). Thus, in this essay, I investigate whether the disclosures of internal control weaknesses are useful to market participants. Specifically, I examine the reaction of market specialists to an annual

---

[12] The adverse selection problem is that material firm-specific information exists and has not been publicly disclosed by the firm. This information without disclosure to the public may be privately available to select traders who invest in costly information acquisition, resulting in an adverse selection problem. This adverse selection problem is predicted to raise spreads during periods when no information is disclosed by a firm.

audit report of internal control weaknesses and to the severity and remediation of those weaknesses under Section 404.

The first set of analyses is related to whether ICW firms exhibit lower market liquidity around SOX 404 opinion announcement than non-ICW firms. In this essay, I investigate the reaction of market specialists to the disclosure of internal control when SOX 404 opinions are announced. The literature on microstructure argues that market specialists tend to adjust bid-ask spreads when confronting the change in information environment (Kyle, 1985; Glostem and Milgrom, 1985; Lee et al., 1993; Yohn, 1998; Libby et al., 2002).[13]

The extant literature on internal control reveals that ICW firms, on average, have higher information risk (Ashbaugh-Skaife et al., 2009) and in turn result in greater information asymmetry compared to non-ICW firms. Chin and Weng (2009) indicate that overall information environment, in terms of information uncertainty, is poorer for ICW firm than non-ICW firms. The findings, coupled with the argument that bid-ask spreads are an increasing function of the information risk perceived by market specialists, call into question whether ICW firms exhibit higher bid-ask spreads and in turn have lower market liquidity around SOX 404 opinion disclosures relative to non-ICW firms.

The second question I address is whether the effect of internal control weaknesses on bad-ask spreads varies with the severity of internal control weaknesses. As indicated by Moody's Investors Service (2006; 2007), in contrast to account-level weaknesses, firm-level material weaknesses are less "auditable" and thus more likely

---

[13] The adverse selection problem is that material firm-specific information exists and has not been publicly disclosed by the firm. This information without disclosure to the public may be privately available to select traders who invest in costly information acquisition, resulting in an adverse selection problem. This adverse selection problem is predicted to raise spreads during periods when no information is disclosed by a firm.

to result in inaccurate financial reports.[14] Much of information which investors use in their evaluation is provided directly from the firm (Lang and Lundholm, 1996). Accordingly, I hypothesize and test whether firm-level weaknesses have a stronger negative effect on market liquidity than account-specific weaknesses.

Finally, the essay explores whether firms whose auditors confirm remediation of previous ICW will affect the change in market liquidity. Due to an increase in earnings quality for the firms whose auditors verify remediation of previously reported ICW (Doyle et al., 2007b; Ashbaugh-Skaife et al., 2008), the improvement of control systems and financial reporting process enhances the information quality, thereby increasing their market liquidity in the capital market. Thus, I further investigate the influence of remediation for ICW firms on the market liquidity.

In addition, prior study indicates that precision of the information available to market specialists is positively related to market liquidity (Kyle, 1985). In addition, Chin and Weng (2009) further indicate that internal control weaknesses result in higher level of information uncertainty. These findings address one question about whether ICW has an effect on market liquidity after controlling the information produced by the internal control system. Next, information produced by internal control system mainly consists of public information, rather than private information. It addresses the following question. I further explore whether the association between ICW and bid-ask spreads after controlling information precision is mainly driven by private information. Specifically, I examine whether ICW is (not) associated with bid-ask spreads after controlling for public (private) information precision.

To conduct these tests, I identify a sample of firms that have at least one SOX 404 audited report on internal control system. Using bid-ask spreads as the proxy for

---

[14] Doyle et al. (2007a, 2007b) provide supporting evidence that firm-level material weaknesses will have a stronger association with accruals quality than account-specific material weaknesses.

market liquidity, I find that ICW firms have wider bid-ask spreads than non-ICW firms. After decomposing ICW firms into firms with account-specific weaknesses and firms with firm-level weaknesses, I find that only firm-level weaknesses are associated with wider spreads, and thus the association between ICW and spreads is primarily driven by firms with firm-level weaknesses. Third, I further find that the change in bid-ask spreads are significantly lower for firms remedying a previously weakness relative to firms without remedying their weaknesses around the announcement of SOX 404 opinion.

Further analyses indicate that after controlling public information precision, I find that ICW is positively associated with bid-ask spreads; in contrast, after controlling for private information precision, I find no association between ICW and bid-ask spreads. The plausible reason for the difference is that information produced by internal control system mainly consists of public information, instead of private information, and thus specialists still perceive the adverse selection risk arising from ICW even after controlling for public information precision.

As robustness checks, several sensitivity analyses are conducted. First, an important concern regarding the specifications is the endogeneity issue. After controlling the selection bias, the primary findings are robust and remain qualitatively unchanged. Second, I use different windows around the announcement of SOX 404 opinion to measure bid-ask spreads. These results of using different windows to test the models are consistent with the previous findings. Finally, after controlling the impact of volatility, the findings are robust and consistent with previous results.

This essay contributes to the literature in several important aspects. First, I contribute to the literature on the consequence of SOX by linking ICW with market liquidity. Unlike prior research, which explores more specific consequence of SOX such as discretionary accruals (Doyle et al., 2007b; Ashbaugh-Skaiffe et al., 2008) and

cost of equity (Ogneva et al., 2007; Ashbaugh-Skaiffe et al. 2009), I provide supporting evidence that material internal control weaknesses, in particular firm-level weaknesses, results in more pervasive market reaction, at least in terms of market liquidity .

Second, this essay contributes to the microstructure literature by documenting that the adverse selection risk arising from material internal control weaknesses affects market specialists' behavior, in terms of bid-ask spreads. This essay contributes to the microstructure literature by further providing evidence that ICW is (not) associated with bid-ask spreads even after controlling for public (private) information precision. The results indicate that accounting information system (i.e., internal control system) has direct and indirect affect on bid-ask spreads set by specialists. Lastly, this essay further contributes to the literature by documenting that market specialists tend to adjust bid-ask spreads in response to firms' remediation of accounting information system (i.e., internal control weaknesses).

Fourth, this essay contributes to the intense debate regarding costs and benefits of Section 404 and has policy implications for regulators. When the public expresses the concerns that Section 404 provides little benefits to investors (e.g., Burn, 2007), my findings provide additional evidence consistent with the notion expressed by the regulators that the requirement of internal control disclosure will decrease the information risk, and then lead to a lower degree of information asymmetry.

Finally, this essay provides evidence that the disclosure of internal control is more informative to the public and is also used by market participants to re-estimate ICW firms' values. SOX 404 opinions not only disclose the quality of internal control systems, but also the adjustments surfaced in the financial process. Thus, my findings support the evidence that SOX 404 opinions are informative to the public and can help users know about the related control problems and significant adjustments of

control activities.

The rest of this essay is organized as follows. In Section 2, the related literature and the development of the hypotheses will be discussed. The sample and the research design will be explained in Section 3. Finally, the empirical results will be presented and discussed in Section 4, and the conclusions will be presented in Section 5.

Ⅱ. Literature Review and hypotheses development

2.1 Internal control weaknesses, information asymmetry and market liquidity

Analytical and empirical studies (e.g., Diamond and Verrecchia, 1991; Welker, 1995) indicate that greater disclosure reduces the adverse price effect of large trades, thus increasing market liquidity. In contrast, when perceiving the overall information risk is increasing, market participants prefer to set wider bid-ask spreads to reduce losses from trading with informed traders (Glostem and Milgrom, 1985; Easley and O'Hara, 1992; Welker, 1995). Thus, information asymmetry is thought to promote an unwillingness to trade and increase the cost of capital as investors "price protect" against potential losses from trading with informed investors, and then results in illiquidity (Bhattacharya and Spiegel, 1991; Welker, 1995).

Recent studies investigate the influence of public information disclosure on information asymmetry and market liquidity. These studies explore trading activity and market liquidity around particular events and find that market specialists will adjust their bid and ask price when the information environment changes (Lee et al., 1993; Yohn, 1998; Libby et al., 2002). Several theoretical studies demonstrate that public information (e.g., earnings) might influence information asymmetry (Verrecchia, 1982; Diamond, 1985; Diamond and Verrecchia, 1991). When specialists believe the overall information risk in the market is rising, they will set wider bid-ask spreads in response to increasing information asymmetry (Glosten and Milgrom, 1985;

Easley and O'Hara, 1992). Verrecchia (1982) set a theoretical model which demonstrates that information asymmetry in the market decreases just *after* earnings announcements. Diamond (1985) concludes that the disclosure of information makes traders' beliefs more homogeneous and reduces informed traders' speculative positions.

Empirical evidence also supports that information asymmetry and market liquidity will be affected by the disclosure of public information and the specific events. Welker (1995) finds that bid-ask spreads for firms with better disclosure policies are lower than for firms with poor disclosure policies. Roulstone (2003) considers analyst activity as a proxy for the amount of information publicly available about a firm. He finds that analyst following is negatively associated with bid-ask spreads, indicating that the adverse selection component of the spreads is reducing in analysts following. However, several studies indicate that financial irregularities (e.g., earnings restatements or business scandals) cause illiquidity in the capital market (Eleswarapu et al., 2004; Chiyachantara et al., 2004; Bushee and Leuz, 2005). These findings support the idea that a change in bid-ask spreads and market liquidity is primarily driven by a change in information environment.

Management's report of internal controls and effectiveness of internal controls are required to disclose in annual audit opinions under Section 404. The information of material weaknesses may lead to market participants question about the remediation expenses and the possibility of misstatement errors over financial reporting. This indicates that market participants appear to concern about the presence of control weaknesses that may impact the financial statement and doubt about the management's ability to control the business. Thus, the specific characteristics of control weaknesses will convey information to market participants and affect their reaction (Hammersley et al., 2007).

Prior empirical research suggests that because ineffective internal controls result in higher information risk and more analysts' forecast errors and bias (Ashbaugh-Skaife et al., 2009; Kim et al., 2008; Xu and Tang, 2009), ICW firms are expected to have greater information asymmetry. Since internal control weaknesses are important determinant characteristics of a firm's information or accounting risk, it might increase the level of information asymmetry and change the information environment (Glosten and Milgrom, 1985; Diamond and Verrecchia, 1991). This essay expects that weak internal controls increase information risk and reduce information quality, and then enhance the level of information asymmetry, thereby leading to a reduction in market liquidity. Thus, I predict that ICW firms have greater information asymmetry, and then impact their market liquidity. The first hypothesis of this essay is as follows:

H1: Internal control weakness is negatively associated with market liquidity.

2.2 The effect of severity of internal control weakness on market liquidity

Moody's (2006, 2007) and Doyle et al. (2007) suggest that the severity of internal control problems varies substantially within the material weakness classification, and propose that material weaknesses fall into one of two categories., account-specific or firm-level weaknesses. Account-specific weaknesses are related to internal control over specific account balances or transaction-level processes and are auditable by performing additional substantive procedures. However, firm-level material weaknesses are related to more fundamental problems, which auditors may not be able to audit effectively. Thus, firm-level weaknesses lead to doubt about not only management's ability to report accurate financial statements, but also its ability to operate the business. Firm-level weaknesses may significantly result in an

increased likelihood of financial reporting problems in the future because of the weak foundation of internal control. Doyle et al. (2007b) suggest that ICW firms with firm-level weaknesses have lower accruals quality relative to ICW firms with account-specific weaknesses.

Consequently, unable to efficiently maintain internal control systems and processes, managements of firms with firm-level control problems are not capable of preparing adequate financial reporting processes to the public and conduct the business. Therefore, this essay explores the influence of the severity of internal control weaknesses on market liquidity. I believe that firm-level weaknesses are more serious than account-specific weaknesses and most commonly represent an ineffective financial reporting process. Therefore, I posit that ICW firms with firm-level weaknesses have more impact on market liquidity, which leads to the second hypothesis of this essay:

H2: Firm-level control weaknesses have lower market liquidity than account-specific control weaknesses.

2.3 Remediation of ICW firms and market liquidity

In the analyses of successive year SOX 404 opinions, Ashbaugh-Skaife et al. (2008) document that firms whose auditors confirm remediation of previously reported internal control deficiencies (going form adverse to unqualified SOX 404 opinion) exhibit a significant improvements in accrual quality relative to ICW firms that fail to remediate their control problems. Li et al. (2007) find that ICW firms are more likely to experience CFO turnover, and the quality of new CFO is positively related to an improvement in internal control systems. In order to receive an unqualified SOX 404 audit opinion in successive years, ICW firms will use several

mechanisms to remediate their weak control system, such as adequate separation of duties, proper authorization of transactions and activities, adequate documents and records, physical control over assets and properties, and independent inspection (Li et al., 2007; Li et al., 2008). When the firms who previously received adverse SOX 404 audit opinion remedy their control systems in successive years, the improvement can result in more effective design and operation of internal control systems and thus produce in turn better earnings quality (Ashbaugh-Skaife et al. 2008).

Since the remediation firms will exhibit more improvement on estimated risk and information risk than non-remediation firms, I posit that specialists will perceive the remediation and narrow the bid-ask spreads, which in turn results in an increase of market liquidity. The following hypothesis specifies the expected relationship between remediation firms and market liquidity:

H3: Remediation firms exhibit a positively association with market liquidity relative to non-remediation firms.

3. Research Design and Data Sources

3.1 Research Design

In this section, the regression models are presented. I will then discuss in detail the measures of bid-ask spreads and the precisions of public and private information, followed by a discussion of the sample selection procedure.

3.1.1 The impact of internal control weakness on market liquidity

In order to test the impact of a SOX 404 audit opinion revealed to the public, I use a standard event study methodology to examine the relationship between internal control weaknesses and market liquidity. Denoting the announcement date of annual SOX 404 opinion as trading day 0, I conduct the period from trading day 0 to trading

day +3. I use a multivariate linear regression model to control other factors related to the market impact of an announcement such as price, return, volume, firm size, and other firm-specific variables. In equation (10), I expect the coefficient on *ICW* (g_1) is positively related to bid-ask spreads:

$$Spread_{i,} = g_0 + g_1 ICW_i + g_2 Price_i + g_3 Return_i + g_4 Volume_i + g_5 Size_i + g_6 Num_i + g_7 Surprise_i$$
$$+ g_8 Growth_i + g_9 Stdroe_i + \varepsilon \tag{10}$$

Dependent variable

Spread   = ask price - bid price, divided by the average of ask and bid price at the close of trading day 0 to trading day +3 for firm i. In order to avoid the coefficients of independent variables in the regression approximated to zero, this variable is multiplied by 100.

The empirical proxy for market liquidity used in this essay is the closing spreads during the event window. Bid-ask spreads are originally determined by information asymmetry and the quality of information available regarding firm value (Easley and O'Hara, 1992; Callahan, Lee and Yohn, 1997). When market specialists believe the overall information risk in the market is increasing, they prefer to set wider bid-ask spreads in order to avoid potential losses from trading with better informed investors. In addition, bid-ask spreads also represent the level of market liquidity. Wider bid-ask spreads set by market specialists, who confront an increase in adverse selection problem, lead to higher transaction cost and then result in illiquidity in the capital market. Thus, because bid-ask spreads can both capture information asymmetry and market liquidity, I use bid-ask spreads as the proxy in the equation.

Independent variable

ICW   = 1 if the firm i discloses material weakness in internal control, and 0

otherwise. I expect that the ICW firms have wider spreads than non-ICW firms.

Control variables

Price	=	the closing price for firm i on trading day 0;
Return	=	the change in price for firm i from trading day t-1 to trading day 0;
Volume	=	logarithm of trading volume for firm i, day 0;
Size	=	logarithm of assets for firm i, measured at the beginning year;
Num	=	analyst following for firm i in the current year;
Surprise	=	(net income in current year- net income in last year)/net income in last year for firm i;
Growth	=	market value of equity divided by book value of equality in the current year for firm i;
Stdroe	=	standard deviation of return of equity over the previous five years for firm i;

I include the stock price (*Price*) as the control variable since stocks with low prices face higher spreads (Welker, 1995; Roulstone, 2003). Stock price is included based on Roulstone (2003), who documents a negative relation between price and spreads. I also include market return (*Return*) to control the firms' profitability. Brennan and Subrahmanyam (1996) find that bid-ask spreads are related to market returns. I posit that when firms have better performance to the stock market, they will attract more attention from informed investors. Thus, I expect that firms with higher market return will have lower bid-ask spreads. I control the trading volume (*Volume*), which is the natural logarithm of trading volume, because firms with higher trading volume present more opportunities for market specialists to manage their inventory and recoup losses to informed investors (McInish and Wood, 1992). Thus, trading volume should be negatively related to spreads.

Controlling for firm size (*Size*) helps ensure that the relationship between internal control weakness and bid-ask spreads is not primarily driven by large firms (McInish and Wood, 1992; Yohn 1998), which suggests that the stock prices of larger firms are

relatively more informative and thereby the level of information asymmetry is likely to be lower (Chung et al., 1995; Roulstone, 2003). I also include the number of analyst following (*Nu*m) since an increase in the number of analysts following the firm results in smaller spreads in the firm's stock (Roulstone, 2003). I predict that analyst following has a negative association with bid-ask spreads. Finally, I include *Surprise*, *Growth* and *Stdroe* to control the possible effects of uncertainty on a firm's information environment. *Surprise* is calculated as the change in earnings deflated by previous earnings. *Growth* is defined as the market value of equity divided by book value of equality. *Stdroe* is measured by the standard deviation of return of equity over the previous five years. I predict that spreads will be positively related to larger change in earnings, the greater growth opportunity of a firm and the volatility with the standard deviation of equity (Welker, 1995; Chung, et al., 1995; Libby et al., 2002; Roulstone, 2003).

3.1.2 The impact of severity of weaknesses on the bid-ask spread

In order to test whether the information content of internal control weaknesses disclosure depends on the severity of the internal control weaknesses, I classify internal control weaknesses as either account-specific or firm-level weaknesses. The classification of firm-level and account-specific weaknesses is similar to Moody's classification scheme (Moody's, 2006, 2007) and Doyle et al (2007a). I expect that firm-level weaknesses will be more positively related to bid-ask spreads. The regression testing the impact of the severity of internal control problems on the spreads is as follows:

$$Spread_i = h_0 + h_1 ICW\_acc_i + h_2 ICW\_firm_i + h_3 Price_i + h_4 Return_i + h_5 Volume_i + h_6 Size_i$$
$$+ h_7 Num_i + h_8 Surprise_i + h_9 Growth_i + h_{10} Stdroe_i + \varepsilon \qquad (11)$$

Dependent variable

Spread = ask price - bid price, divided by the average of ask and bid price at the
close of trading day 0 to trading day +3 for firm i. In order to avoid the
coefficients of independent variables in the regression which is
approximate to zero, this variable is multiplied by 100.

Independent variables

ICW_acc = 1 if the firm i discloses account-specific material weakness in internal
control, and 0 otherwise. Following prior studies (Moody's, 2006, 2007;
Doyle et al., 2007a), account-specific weaknesses are defines as the
internal control issues that relates to internal control over specific account
balances or transaction-level processes.

ICW_firm = 1 if the firm i discloses firm-level material weakness in internal control,
and 0 otherwise. Following prior studies (Moody's, 2006, 2007; Doyle et
al., 2007a), firm-level weakness is defined as the internal control issues
that relates to company overall controls, such as an ineffective control
environment, weak financial reporting processes, or ineffective
personnel.

To further test for the severity of internal control weaknesses, 10-Ks in EDGAR
from December 2004 to December 2007 are searched and I classify firms as having
either account-specific or firm-level weaknesses. Following the classification of
Doyle et al. (2007a; 2007b), if a firm has account-specific and firm-level weaknesses,
this firm is considered as an ICW firm with firm-level weaknesses. I predict that
firm-level control weaknesses have greater impact on bid-ask spreads than
account-specific control weaknesses. All other control variables are as previously
defined in equation (10).

3.1.3 The impact of ICW firms with remediation on market liquidity

In order to explore the relationship between ICW firms with remediation and
market liquidity, a standard event study methodology is applied to examine the impact

of remediation on the spreads. I extend the analysis by testing intertemporal changes

in the spread that received SOX 404 opinions in both two years (Ashbaugh-Skaife et

al., 2008; Kim, Song, and Zhang, 2009). The following regressions are conducted:

$$\triangle\; Spread_i = J_0 + J_1 Remediation_i + J_4 \triangle Price_i + J_5 \triangle Return_i + J_6 \triangle Volume_i + J_7 \triangle Size_i$$
$$+ J_8 \triangle Numi + J_9 \triangle Surprise_i + J_{10} \triangle Growth_i + J_{11} \triangle Stdroe_i + \varepsilon \qquad (12)$$

Dependent variable

$\triangle Spread$ = the average bid-ask spread at the close of trading day 0 to trading day+3 minus the average bid-ask spread at the close of trading day-3 to trading day -1 for firm i. In order to avoid the coefficients of independent variables approximated to zero, this variable is multiplied by 100. Inconsistent with the definition of the bid-ask spread in equation (10), the change of the spreads in equation (12) is around the three-day window prior to and the three-day window subsequent to annual earnings announcement as well as SOX 404 opinion announcement date. An intertemporal changing model is used to examine whether the bid-ask spread improves for ICW firms with remediation of internal control systems while their internal control reports are revealed to the public.

Independent variable

Remediation   = 1 if the firm i received an adverse SOX 404 opinion in the current year, but received an unqualified SOX 404 opinion in successive years.

      Remediation captures the incremental effect of the remediation for ICW firms

that previously received an adverse opinion, but resolved internal control problems in

successive years. To be consistent with the predictions, I expect the coefficient on the

coefficient on *Remediation* to be negatively in equation (12). Because I use

intertemporal changing model to examine Hypothesis 3, all the control variables are

defined as the within-firm difference for two-year observations.

3.2 Sample selection

I obtain the initial sample of 12,459 that filed first-time Section 404 reports with the SEC between November 2004 and December 2007 from the *Audit Analytics* database. This sample comprises 1,361 observations with ineffective internal control and 11,098 observations with effective internal control. The financial statement data are retrieved from *COMPUSTAT North America* database. The variables related to analysts' behavior, such as analysts following and the precisions of analysts' private and public information are retrieved from *I/B/E/S* database.

The sample selection procedure and its effect on sample size are described in Panel A of Table 11. 2,903 observations without analyst forecasts are deleted. Also, 3,044 observations are excluded due to insufficient financial data. Also, in order to acquire bid-ask spreads and closing price, I retrieve the data from *CRSP* database. I obtain the initial sample of 91,502 observations from *CRSP* and after combining the four databases, *Audit Analytics, COMPUSTAT, I/B/E/S* and *CRSP*, I obtain the final sample of 4,356, missing 2,313 observations without spread and closing price variables. Within the sample of market liquidity, I have 416 observations with ICW firms and 3,940 with non-ICW firms.

Similar to Doyle et al. (2007a) and Ashbaugh-Skaife et al. (2007), for the control firms, whole *COMPUSTAT* firms without internal control weaknesses are used in the research period. This essay uses the overall non-material internal control weakness population as the control group, rather than a matched sample in order to eliminate choice-based sample bias[15].

---

[15] Cram and Karan (2009) suggest that the analysis of matched samples can occur technical errors, such as use of unconditional analysis, failure to control for effect of imperfectly matched variables, and non proportionally sample representative. They demonstrate with simulated data how incorrect analysis in a choice-based matched-sample setting can lead to incorrect inferences. The simulations demonstrate that incorrect analysis may (1) fail to detect significant true effects, (2) find false significant effects, and (3) find significant results that are opposite in sign to the true effects.

4. Empirical Results

4.1 Univariate Analyses

Descriptive statistics are initially reported in Panel B of Table 11 for the variables used in the model sample of 4,356 firm-year observations. The table also presents the results of statistics analyses from t-tests and Wilcoxon Z-tests for difference in means and medians between the two types of firms. The mean (median) values of bid-ask spreads (*Spread*) for ICW firms and non-ICW firms are 0.5504 (0.3541) and 0.4205 (0.2641) respectively. The t-test of the mean value and the z-test of median value of *Spread* for ICW firms are significantly larger than those for non-ICW firms. For the control variables, I find that ICW firms have lower market price (*Price*), smaller firm size (*Size*) and trading volume (*Volume*), less analysts following (*Num*) and growth opportunity (*Growth*) and higher volatility (*Stdroe*) relative to non-ICW firms.

Table 12 presents the results of Pearson correlation for the sample. The results reveal that the dummy variable for internal control weaknesses (*ICW*) is positively associated with bid-ask spreads (*Spread*) (coef.=0.0654, p<0.01), as well as account-specific and firm-level control weaknesses. This evidence provides preliminary support Hypothesis 1 that ICW firms have a higher degree of information asymmetry and lower level of market liquidity. I further find that firms with higher market price, more trading volume, larger size, more analysts following and less volatility have narrower bid-ask spreads and better market liquidity in the capital market.

Table 11

Panel A: Sample selection	
Number of company-years during 2004-2007 period	12,459
Less: Non analyst forecast firms	(2,903)
Less: Missing financial data	(3,044)
Less: Missing spread and closing price data	(2,313)
Total sample for market liquidity	4,356

Panel B: Descriptive statistics of the variables for analysts' information precision model

	Non-ICW firms			**ICW firms**			
	Mean	Median	Predicted Difference	Mean	Median	t-test of Mean	z-test of Median
Spread	0.4205	0.2641	<	0.5504	0.3541	-4.40***	-6.06***
Price	35.6611	30.18	>	22.3702	18.0000	8.03***	12.39***
Return	0.0022	0.0009	>	0.0024	0.0007	0.95	0.15
Volume	13.6908	13.7441	>	13.5303	13.4378	1.89*	2.23**
Size	7.5536	7.6580	>	6.9336	6.5762	7.65***	8.54***
Num	5.9096	4	>	4.7644	3	4.51***	3.77***
Surprise	0.4851	0.1292	>	-0.8143	-0.2316	1.07	7.40***
Growth	3.8058	2.5283	>	2.9606	2.32214	0.85	3.28***
Stdroe	0.4374	0.0838	<	0.4959	0.1602	-0.43	-7.69***

a. Variable definition

Spread	=	ask spread-bid spread, divided by the average of ask and bid price
Price	=	the closing price for firm on trading day t
Return	=	the change in price for firm from trading day t-1 to trading day t
Volume	=	logarithm of trading volume
SIZE	=	logarithm of assets;
Num	=	the number of analysts' following
Surprise	=	(net income in current year- net income in last year)/net income in last year;
Growth	=	market value of equity divided by book value of equality;
Stdroe	=	standard deviation of return of equity over the previous five years;

b. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

Table 12
Pearson correlation matrix

	Spread	ICW	ICW_acc	ICW_firm	Price	Return	Volume	Size	Num	Surprise	Growth	Stdroe
Spread	1											
ICW	0.0654***	1										
ICW_acc	0.0403***	0.8009***	1									
ICW_firm	0.0616***	0.5523***	-0.0464***	1								
Price	-0.1784***	-0.1187***	-0.0953***	-0.0652***	1							
Return	0.0056	0.001	0.0073	-0.0082	0.0209	1						
Volume	-0.3392***	-0.0274*	-0.0281*	-0.011	0.0650***	0.019	1					
Size	-0.2791***	-0.1133***	-0.0984***	-0.0542***	0.3580***	-0.021	0.4363	1				
Num	-0.1852***	-0.0671***	-0.0595***	-0.0296**	0.1515***	-0.0125	0.4268***	0.3549***	1			
Surprise	-0.0060	-0.016	-0.0193	0.0006	-0.0075	-0.0117	0.0004***	-0.0148	-0.0058	1		
Growth	-0.0233	-0.013	-0.0139	-0.0023	0.021	-0.0107	0.0255*	-0.0316**	0.0071	0.0132	1	
Stdroe	0.0301**	0.0064	0.0061	0.0017	-0.0286*	-0.0038	-0.0018	-0.0535***	-0.0428**	-0.0027	0.0251*	1

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.

b. .See Table 11 for definitions of all variable

4.2 Regression Results

4.2.1 Multivariate analysis of market liquidity and internal control weaknesses

Panel A of Table 13 displays the univariate descriptive statistics on bid-ask spreads for the two sub-samples of firms that are ICW firms and non-ICW firms. I also compare bid-ask spreads in pre-SOX 404 opinion announcement with that in post- SOX 404 opinion announcement (event day). As shown in Panel A of Table 13, the mean value of bid-ask spreads in post event date is larger than that in pre-event date for both sub-samples of ICW firms and non-ICW firms, and is significantly different from zero for the ICW firms. These results indicate that bid-ask spreads are larger for ICW firms than for non-ICW firms after SOX 404 opinion announcement. Furthermore, I compare the difference in spreads between ICW firms and non-ICW firms in the pre and post SOX 404 opinion announcement. The result shows that the mean value of bid-ask spreads for ICW firms is significantly larger than that for non-ICW firms around the pre and post event. Thus, regardless of pre or post SOX 404 opinion announcement, bid-ask spreads are wider for ICW firms, compared to non-ICW. The results from Panel A support the notion that ICW firms experience higher degree of information asymmetry and poor liquidity than non-ICW firms.

Panel B of Table 13 presents the summary results for regressing ICW on market liquidity. The coefficient on *ICW* is in the predicted direction and statistically significant (coef.=0.0525, p=0.0570), indicating that if firms with weak internal control have wider spreads and in turn lead to poor liquidity than other firms. Thus, the uncertainty about information quality for ICW firms will lead to an increase in information asymmetry surrounding the announcement of SOX 404 opinion. This evidence supports Hypothesis 1 that weak internal control decreases the degree of market liquidity while adverse SOX 404 opinion is released to the public, consistent with direct effect of internal control weakness on market liquidity.

Regarding the control variables, the coefficient on *Price* is significantly negative (coef.= -0.0020, p<0.01), suggesting that if a firm has a higher price in the stock market, it is likely to have less information asymmetry and better liquidity. The coefficient on *Volume* is negatively correlated with spreads at 1% significant level, meaning that firms with higher trading volume represent less information asymmetry in the capital market. The coefficient on *Size* is negatively correlated with spreads, indicating that larger firms lead to fewer problems with information asymmetry and illiquidity.

Table 13

Panel A: Descriptive statistics of the variables					
		Pre event	Post event	Difference	t test
ICW firms	Mean	0.1911	0.2151	-0.0240	1.60*
Non ICW firms	Mean	0.1550	0.1584	-0.0033	0.80
Difference		0.0361	0.0567		
t test		3.45***	6.36***		

Panel B: Bid-ask spreads and internal control weaknesses				
	Predicted sign	Coef.	P value	
Intercept	+/-	2.0418	0.0000***	
ICW	+	0.0525	0.0570*	
Price	-	-0.0020	0.0000***	
Return	-	0.2212	0.2210	
Volume	-	-0.0937	0.0000***	
Size	-	-0.0365	0.0000***	
Num	-	-0.0007	0.6880	
Surprise	+	-0.0005	0.1870	
Growth	+/-	-0.0001	0.5720	
Stdroe	+	0.0056	0.0800*	
N		4356		
R-square		0.1539		

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.
b. See Table 11 for definitions of all variables.

4.2.2 Multivariate analysis of market liquidity and the severity of weaknesses

In this section, I further examine whether there are differential effects of account-specific or firm-level weaknesses on market liquidity. Table 14 displays summary results of estimating regressions in equation (11). The result represents that

the coefficients of firm-level weaknesses (*ICW_firm*) are significantly and positively associated with the bid-ask spreads at one % level (coef. = 0.1303, p=0.0040), but the coefficient of account-specific weaknesses (*ICW_acc*) are insignificantly related to the spreads. Consistent with the prediction, F-test further shows that the coefficient on *ICW_firm* is significantly larger than that on *ICW_acc* (F-value = 6.47, p= 0.0000, two-tailed). This is consistent with my prediction that there are differential effects of the severity of control weaknesses on market liquidity among ICW firms. Thus, the firms with firm-level weaknesses have wider spreads and more severity of information asymmetry than the firms with account-specific weaknesses.

Because firm-level weaknesses have the potential to allow errors in discretionary accruals to influence financial statements, the degree of firm-level weakness is more severe than the degree of account-specific weakness. Therefore, the result provides evidence that firm-level control weaknesses decrease a firm's market liquidity, rather than account-specific weaknesses.

Table 14

Bid-ask spreads and the severity of weaknesses

	Predicted sign	Dependent variable: *spread*	
		Coef.	P value
Intercept	+/-	2.0406	0.0000***
ICW_acc	+	0.0267	0.4180
ICW_firm	+	0.1303	0.0040***
Price	-	- 0.0020	0.0000***
Return	-	0.2214	0.2210
Volume	-	- 0.0937	0.0000***
Size	-	- 0.0365	0.0000***
Num	-	- 0.0007	0.6790
Surprise	+	- 0.0006	0.1850
Growth	+/-	- 0.0002	0.5610
Stdroe	+	0.0057	0.0800*
ICW_firm>ICW_acc		F=6.47	0.0000***
N		4356	
R-square		0.1548	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.
b. See Table 11 for definitions of all variables.

4.2.3 Multivariate analysis of market liquidity and remediation

In this section, I examine whether firms whose auditors confirm remediation of previously reported internal control weakness can reduce the changes in their spreads in the capital market. The sample for examining intertemporal changes is reduced to 1,083 observations because I only consider the firms with successive years. I use the changes in spreads in the event window consisting of the six-trading-day period which brackets each announcement. The pre-event period is the three trading days prior to each SOX 404 opinion announcement and the post-event period is the three trading days including announcement day. The change in spreads is the difference between the spreads for each of the pre-event period and post-event period.

The result of Table 15 shows that the coefficient on *Remediation* is significantly and negatively associated with spread change (coef.= -0.3621, p=0.0150), indicating that ICW firms which remedy their internal control problems can lower the degree of information asymmetry and enhance their market liquidity relative to ICW who fail to remedy those problems. The result is consistent with the prior studies that ICW firms may become more aggressive to disclose their information and try to rebuild investors' confidence in the year of remediation (e.g., Ashbaugh-Skaife et al. 2008), thereby increasing their market liquidity after the announcement of SOX 404 opinion. Thus, this result corresponds with my prediction and supports Hypothesis 3 that an improvement in control system increases the change in liquidity in the capital market.

Table 15

The result of regression of bid-ask spreads on remediation

	Dependent variable: *spread*	
	Coef.	P value
Intercept	-1.3994	0.0000***
Remediation	-0.3621	0.0150**
△*Price*	0.0123	0.0000***
△*Return*	1.7227	0.1480
△*Volume*	-0.0014	0.9470
△*Size*	0.0589	0.0010***
△*Num*	0.0004	0.9340
△*Surprise*	-0.0006	0.8480
△*Growth*	0.0020	0.3090
△*Stdroe*	0.0045	0.5610
N	1083	
R-square	0.1398	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.
b. See Table 11 for definitions of all variables.

4.3 Further Analyses: The indirect effect of ICW on market liquidity

The empirical results reported thus far focus primarily on the direct effect of material internal control weaknesses on bid-ask spreads set by specialists. As mentioned earlier, while the nature of internal control has a direct and negative effect on market liquidity, it also likely has an indirect effect on market liquidity via the information produced by the internal control system. Prior studies indicate that precision of the information available to market specialists is positively related to market liquidity (Kyle, 1985). In addition, Chin and Weng (2009) further find that material internal control weaknesses adversely impact information precision and in turn increase overall information uncertainty, as proxied by measures proposed by Barron et al (1998) (Barron et al., 2002; Botoson et al., 2004). These findings address one question as to whether the presence of ICW still has an incremental effect on bid-ask spreads after controlling for the precision of information produced by the

internal control system. After controlling for the precision of information produced by the internal control system, the significant relationship between ICW and market liquidity represents that market specialists set wider bid-ask spreads than expected, and thus ICW has direct and indirect effects on specialists' behaviors, at least in term of bid-ask spreads.

To gain insights into the indirect effect of ICW, I investigate the relationship between the interaction of analysts' information precision and internal control weaknesses and bid-ask spreads. The following equation is used to examine the indirect effect of ICW on bid-ask spreads through the precisions of public and private information:

$$Spread_i = k_0 + k_1 ICW_i + k_2 RPUBLIC_i + k_3 ICW_i*RPUBLIC_i + k_4 Price_i + k_5 Return_i$$
$$+ k_6 Volume_i + k_7 Size_i + k_8 Num_i + k_9 Surprise_i + k_{10} Growth_i + k_{11} Stdroe_i + \varepsilon \qquad (13)$$

$$Spread_i = l_0 + l_1 ICW_i + l_2 RPRIVATE_i + l_3 ICW_i*RPRIVATE_i + l_4 Price_i + l_5 Return_i$$
$$+ l_6 Volume_i + l_7 Size_i + l_8 Num_i + l_9 Surprise_i + l_{10} Growth_i + l_{11} Stdroe_i + \varepsilon \qquad (14)$$

Dependent variable

Spread = ask price - bid price, divided by the average of ask and bid price at the close of trading day 0 to trading day +3 for firm i. In order to avoid the coefficients of independent variables in the regression which is approximate to zero, this variable is multiplied by 100.

Independent variables

ICW = 1 if the firm i discloses material weakness in internal control, and 0 otherwise.

RPUBLIC = fractional rank of public information precision for firm i. The public information precision (*PUBLIC*) is drawn from Barron et al. (1998) and Botosan et al. (2004). The public information precision from analysts, *PUBLIC*, is defined as follows:

$$PUBLIC = \frac{SE - (D/N)}{[(SE - (D/N) + D]^2}$$

RPRIVATE   = fractional rank of public information precision for firm i. The private information precision, (*PRIVATE*) is drawn from Barron et al. (1998) and Botosan et al. (2004). The private information precision, *PRIVATE*, can be defined as follows:

$$PRIVATE = \frac{D}{[(SE - (D/N) + D]^2}$$

Where SE=expected square error in the mean forecast= $(\overline{F}_{it} - A_{it})^2$; D=expected forecast dispersion = $\frac{1}{N-1}\sum_{i=1}^{N} (\overline{F}_{it} - F_{ijt})^2$, N= the number of forecasts; $\overline{F}_{it}$ =mean forecast for firm i, year t; A_{it} =actual earnings forecasts for firm i, year t; and F_{ijt} = analyst j's forecast of earnings for firm i, year t.

Following Botosan et al. (2004), I estimated the public and private information precisions using the analysts' most recent one-quarter-ahead forecasts *before* annual earnings announcement. Prior studies show that estimated measures of public and private information, *PUBLIC* and *PRIVATE*, are heavily skewed to the right (Gu, 2004; Botosan et al., 2004). I thus follow Botosan et al. (2004) and use fractional ranks of public and private information precisions, *RPUBLIC* and *PRIVATE*, as proxies for public and private information precisions, respectively, in the equations (13) and (14)

ICW*RPUBLIC= the interaction between ICW firms and the rank of precision of public information from analysts. The interaction term in equation (13) allows me to test whether the lower degree of precision of public information in ICW firms influences bid-ask spreads. I expect the coefficient on this interaction to be positive.

ICW*RPRIVATE= the interaction between ICW firms and the rank of precision of private information from analysts. The interaction term in equation (4) allows me to test whether the precision of private information in ICW firms influences bid-ask spreads. Because of two opposite directions of the influence of the private information precision, I don't expect the direction of this interaction.

The result in column (1) of Table 6 shows that bid-ask spreads are narrower for firms with higher public information precision than for those with lower precision, as predicted. It also can be seen that although the coefficient of ICW becomes insignificant, the coefficient on the interaction between ICW firms and public information precision (coef.=0.00015, p=0.0250) is significantly positive. The results indicate that even after controlling for the precision of public information produced by internal control system, material internal control weaknesses still have a significant negative effect on market liquidity. Stated differently, ICW has both direct and indirect effect on bid-ask spread set by market specialists.

However, in column (2) of Table 16, although coefficient on private information precision is significantly positive, the coefficient on the interaction of ICW and private information precision is not significantly different from zero. The results indicate that unlike results in column (1), after controlling for private information precision, ICW has not an effect on bid-ask spreads. One plausible reason for the results is that information produced by internal control system mainly comprises public information, instead private information. Accordingly, the coefficient of *ICW* becomes insignificant after controlling for private information precision. In column (3), where both takes into account *RPUBLIC*ICW* and *RPRIVATE*ICW*, the results are consistent with those in columns (1) and (2).

In sum, after controlling for public information precision, I find that ICW is positively associated with bid-ask spreads. In contrast, after controlling for private information precision, I find no association between ICW and bid-ask spreads. The possible reason for the difference is that information produced by internal control system primarily consists of public information, rather than private information, thus specialists still perceive the adverse selection risk arising from ICW even after controlling for public information precision.

Table 16

The result of regression of the interaction of ICW and information precision

	Dependent variable: *spread*		Dependent variable: *spread*		Dependent variable: *spread*	
	Coef.	P value	Coef.	P value	Coef	P value
Intercept	2.11737	0.0000***	2.10245	0.0000***	2.12570	0.0000***
ICW	- 0.04199	0.3850	0.00355	0.9360	-0.04395	0.3860
RPUBLIC	- 0.00008	0.0000***			-0.00041	0.0430**
*RPUBLIC*ICW*	0.00015	0.0250**			0.00015	0.0580*
RPRIVATE			- 0.00008	0.0000***	-0.00005	0.0220**
*RPRIVATE*ICW*			0.00008	0.2320	-0.00000	0.9380
Price	- 0.00208	0.0000***	- 0.00293	0.0000***	-0.00211	0.0000***
Return	0.24317	0.1790	0.19946	0.2700	0.21957	0.2250
Volume	- 0.09344	0.0000***	- 0.09312	0.0000***	-0.09328	0.0000***
Size	- 0.03702	0.0000***	- 0.03662	0.0000***	-0.03694	0.0000***
Num	- 0.00151	0.4010	- 0.00047	0.7940	-0.00094	0.6050
Surprise	- 0.00013	0.6810	- 0.00014	0.6570	-0.00013	0.6980
Growth	- 0.00052	0.2050	- 0.00052	0.2110	-0.00052	0.2090
Stdroe	0.00590	0.0680*	0.00565	0.0800*	0.00580	0.0730*
N	4356		4356		4356	
R-square	0.1560		0.1539		0.1572	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.
b. See Table 11 for definitions of all variables.

4.4 Sensitivity Analyses

4.4.1 Controlling endogeneity effect

An important concern regarding equation (10) is the endogeneity issue. Because the firms with poor market liquidity are likely to have material internal control weakness for some reasons unrelated to their information asymmetry and the control variables can not capture this effect, the following 2-stage treatment effect model is used in order to control for potential self-selection bias related to a firm's choice of internal control system or endogeneity problem in the regressions. Specifically, following the determinants of internal control weaknesses from Doyle et al. (2007a) and Ashbaugh-Skaife et al. (2007), the following probit model is applied to predict the presence of internal control weakness disclosure:

$$WEAKNESS_{i,t} = \delta_0 + \delta_1 Market_{i,t} + \delta_2 Loss_{i,t} + \delta_3 Restatement_{i,t} + \delta_4 CPA_{CHANGiEi,t}$$

$$+ \delta_5 M\&A_{i,t} + \delta_6 Restructure_{i,t} + \delta_7 Foreign_{i,t} + \delta_8 Outsider_{i,t} + \delta_9 Institute_{i,t}$$

$$+ \delta_{10} AC_{i,t} + \delta_{11} GDP_{i,t} + \delta_{12} PCE_{i,t} + \varepsilon \qquad (15)$$

Where *Weaknesses* denotes the *ex ante* probability of a firm reporting internal control weakness that is *ex post* coded one if a firm disclose their control weaknesses under the Section 404 and zero otherwise. I obtain consistent estimates via full maximum likelihood estimation. In the first stage, I include the following variables in the regressions: the firms' market value of equity (*Market*), the audit quality (*Big4*), financial leverage (*Lev*), profitability (*Loss*), financial error (*Restatement*), the change of organization, such as restructure, merge or acquisition (*M&A or Restructure*), and the foreign sales of the firms operations (*Foreign*). I also add the quality of corporate governance and the index of macroeconomics in the first stage. I obtain consistent estimates via full maximum likelihood estimation.

Panel A in Table 17 reveals the estimated results from the two stage treatment effect model. In the fist stage, I find that firms with higher market value of equity, merge and acquisition have less control weaknesses. This result also documents that firms with previous loss, previous restatements, organization change and more complex foreign transactions are more likely to have problems with their internal control systems. The result at the first stage is similar to previous research (Doyle et al., 2007a; Ashbaugh-Skaife et al., 2008). After the endogeneity was controlled, it can be seen that, with the selection-bias correction, the coefficients of *ICW* are positive and significant at 1 % level, consistent with the result in Panel B of Table 13. The results indicate that market liquidity is poor for ICW firms than for non-ICW firms, regardless of whether the self-selection bias is controlled or not. As a consequence, after correcting selectivity bias and controlling other known factors related to the spreads, my findings are qualitatively unchanged.

4.4.2 Internal control weakness counts

Most of the prior studies investigating the effect of internal control weaknesses (Ogneva et al., 2007; Chan et al., 2007; Doyle et al.,, 2007b; Ashbaugh-Skaife et al., 2008, 2009) by using "whether there are material internal control weakness" as the proxy for weak internal control system. However, using indicator variable analyzing the effect of SOX 404 neglects the different levels of internal control weakness. I replaced the indicator of ICW firms with the count of internal control weaknesses (*NICW*) as a proxy variable. The result is shown in Panel B of Table 17. The results are similar to the previous research if firms with more internal weaknesses have poor liquidity in the capital market. Thus, I find that the results are robust to use different definition of internal control weaknesses. In summary, the result shown in Panel B of Table 17 supports my hypothesis, suggesting that more internal control weaknesses leads to increase the level of information asymmetry and lower market liquidity.

Table 17

Panel A: Results of controlling endogeneity					
Second stage	Equation (10)		First stage	Dependent variable: ICW	
	Coef.	P value		Coef.	P value
ICW	0.3047	0.0000***	*Intercept*	- 1.3201	0.0920*
Price	- 0.0011	0.0000***	*Market*	- 0.1978	0.0000***
Return	0.0921	0.6640	*Loss*	0.2259	0.0220**
Volume	0.0428	0.0000***	*Restatement*	1.5153	0.0000***
Size	- 0.0205	0.0010***	*CPA$_{change}$*	0.1608	0.5190
Num	- 0.0126	0.0000***	*M&A*	- 0.3096	0.0540*
Surprise	- 0.0001	0.7310	*Restructure*	0.1529	0.0620*
Growth	- 0.0005	0.2190	*Foreign*	0.3374	0.0000***
Stdroe	- 0.0018	0.5890	*Outsider*	- 0.4169	0.2690
lambda	- 0.1726	0.0000***	*Institute*	- 0.0692	0.5080
			AC	- 0.3607	0.2660
			GDP	- 0.0927	0.7290
			PCE	0.8912	0.1270

Panel B: Results of bid-ask spread on internal control counts

	Coef.	P value
Intercept	2.0403	0.0000***
NICW	0.0250	0.0070***
Price	- 0.0020	0.0000***
Return	0.2120	0.2410
Volume	- 0.0938	0.0000***
Size	- 0.0366	0.0000***
Num	- 0.0007	0.6940
Surprise	- 0.0005	0.1850
Growth	- 0.0002	0.5650
Stdroe	0.0056	0.0820*
N	4356	
R-square	0.1546	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.
b. See Table 11 for definitions of all variables.

4.4.3 Another windows of calculating bid-ask spreads

In above regressions, I measure bid-ask spreads over three-days after the announcement of SOX 404 audited opinion. To further provide insight into sensitivity of empirical results to different windows, I also examine different window periods such as t= (-1, +1), (-3, +3) and (0, +2) in equation (10) (e.g. beginning day = t -1, and ending on day = t +1 or beginning day = t -3 and ending day = t +3 or beginning day=t and ending day = t+2). The results in Table 18 show that the primary inferences regarding the relationship between market liquidity and internal control weaknesses are very similar to previous results in Panel B of Table 13. Thus, these findings are robust with different windows around the announcement of SOX 404 audited opinion.

Table 18

Another windows of calculating bid-ask spreads in equation (1)

	Predicted sign	Window (-1,+1) Coef.	Window (-1,+1) P value	Window (-3,+3) Coef.	Window (-3,+3) P value	Window (0, 2) Coef.	Window (0, 2) P value
Intercept	+/-	2.1256	0.0000***	3.5941	0.0000***	1.8617	0.0000***
ICW	+	0.0494	0.0630*	0.1153	0.0260**	0.0457	0.0740*
Price	-	- 0.0014	0.0000***	- 0.0035	0.0000***	- 0.0014	0.0000***
Return	-	0.2767	0.1140	0.2941	0.3860	0.1860	0.2690
Volume	-	- 0.2242	0.0000***	- 0.1575	0.0000***	- 0.0862	0.0000***
Size	-	0.0007	0.6530***	0.0037	0.2620	- 0.0003	0.8170
Num	-	- 0.0404	0.0000***	- 0.0791	0.0000***	- 0.0341	0.0000***
Surprise	+	- 0.0004	0.2480	- 0.0013	0.0790*	- 0.0005	0.1840
Growth	+/-	0.0002	0.4590	0.0000	0.9470	- 0.0001	0.7430
Stdroe	+	0.0035	0.2590	0.0018	0.7570	0.0042	0.1600
N		4356		4356		4356	
R-square		0.1598		0.1770		0.1397	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.
b. See Table 11 for definitions of all variables.

4.4.4 Controlling the volatility

Bid-ask spreads provide a direct measure of the price protection that uninformed investors' demand as compensation for the perceived information risk related to trading in the capital market. Thus, the wider bid-ask spreads indicates that there is greater information asymmetry and poorer liquidity for those firms. However, bid-ask spreads also represent the volatility in the capital market. Several studies have suggested that the volatility of share price positively affects bid-ask spreads (McInish and Wood, 1992; Cung, et al., 1995). Bid-ask spreads are likely to be measured as market liquidity and volatility in the capital market. In order to avoid capturing the effect of volatility instead of market liquidity, I add volatility index (*VIX*) in equation (10). The VIX has been considered as the "investor fear gauge", which is measured by the current prices of options on the S&P 500 Index and proxied as expected future

stock market volatility over the next 30 calendar days.[16] If expected market volatility

(*VIX*) increases, the investors expect that there will be more volatility in the capital

market. After controlling the effect of volatility, Column 1 of Table19 shows that

firms with weak internal control have wider spreads, but the p-value is only one-tailed

significant (coef.=0.0385, p=0.1890, one-tail). I further partition control weaknesses

into account-specific and firm-level weaknesses. The result shown in column 2 of

Table 19 is similar to the result in Table 14, suggesting that firm-level weaknesses

decrease a firm's market liquidity, rather than account-specific weaknesses. Thus,

after controlling the volatility, this finding is robust and unchanged.

Table 19
The results of controlling the volatility

	Predicted sign	Dependent variable *: spread*		Dependent variable *: spread*	
		Coef.	P value	Coef.	P value
Intercept	+/-	1.8554	0.0000***	1.8571	0.0000***
ICW	+	0.0385	0.1890		
ICW_acc	+			0.0292	0.4010
ICW_firm	+			0.0946	0.0530*
Price	-	-0.0016	0.0000***	- 0.0016	0.0000***
Return	-	0.3060	0.1130	0.3015	0.1190
Volume	-	-0.0924	0.0000***	- 0.0922	0.0000***
Size	-	-0.0350	0.0000***	- 0.0351	0.0000***
Num	-	-0.0010	0.6130	- 0.0010	0.6140
Surprise	+	-0.0001	0.5790	- 0.0001	0.5760
Growth	+/-	-0.0003	0.4040	- 0.0003	0.4020
Stdroe	+	0.0066	0.0620*	0.0066	0.0620*
VIX	+	0.0082	0.0360**	0.0078	0.0450*
N		3665		3665	
R-square		0.1762		0.1943	

a. ***, **,* Denote significant at the 0.01, 0.05, 0.10 levels, respectively.
b. See Table 11 for definitions of all variables.

---

[16] The VIX was introduced by Whaley (1993) for two purposes. First, it was intended to provide a benchmark of expected short-term market volatility. Second, VIX was intended to provide an index upon which futures and options contracts on volatility could be considered (Whaley, 2009).

5. Conclusion

In this essay, the effects of firms' weaknesses in internal control on market liquidity are investigated, as measured by bid-ask spreads. I identify ICW firms as the firms that disclosed a control weakness from November 2004 to December 2007 under Sections 404 of Sarbanes-Oxley. When an internal control weakness is released, there is uncertainty and unreliability on the current information quality and financial statements. Thus, I posit that ICW firms have more information asymmetry and lead to poor market liquidity while their adverse SOX 404 opinions are revealed. I further partition control weaknesses as account-specific or firm-level weaknesses to investigate the impact of the severity of control weaknesses. I classify the sample based on the description of each internal control weakness found in the SEC filing and examine the effect of the severity of internal control weaknesses. Moreover, the indirect effect of ICW on the market liquidity is examined after controlling the information precision contained in analysts' forecasts. Finally, I concern whether firms with improved control weakness will lower the level of information asymmetry and then enhance their liquidity.

After controlling the varieties of innate firm characteristics that prior research shows to be associated with spreads, I find that ICW firms exhibit greater noise in revealing information and poor information transparency relative to non-ICW firms. Thus, ICW firms will increase the level of information asymmetry in capital market, and their poor liquidity is mainly driven by firm-level weaknesses, rather than account-specific weaknesses. Moreover, ICW firms with remediation in following year will enhance their market liquidity relative to ICW firms without remediation. This evidence supports the hypothesis that if firms improve their control system and receive unqualified SOX 404 audit opinion in the successive year, they will reduce information asymmetry, and then increase their market liquidity.

Furthermore, I find that ICW is positively associated with bid-ask spreads after controlling public information precision. In contrast, after controlling private information precision, I find no association between ICW and bid-ask spreads. The possible reason for the difference is that information produced by internal control system primarily consists of public information, rather than private information, thus specialists still perceive the adverse selection risk arising from ICW even after controlling for public information precision.

In sum, the results of this essay provides evidence that market liquidity will be influenced by weak internal controls because ICW firms lack capabilities or resources to effectively control firms' transaction process, and hence lead to a higher degree of information asymmetry in the capital market. Thus, this essay supports that the implementation of Section 404 can enhance the benefit from investors and analysts in the capital market.

IV. Summary and Discussion

This dissertation examines the impact of internal control quality on information precision contained in analysts' forecasts and market liquidity. Using the setting of internal control reporting requirements under Section 404, I conduct several cross-sectional and standard event study tests to assess whether the presence of internal control weaknesses results in less precise public and private information and poor market liquidity. I assess analysts' pubic and private information precisions as a mirror of investors' information sets and bid-ask spreads as a proxy for market liquidity. After controlling a variety of innate firm characteristics, I find that firms that disclosure ICW, especially firm-level control weaknesses, exhibit greater noise in analysts' information quality and higher level of information asymmetry relative to non-ICW firms. I also find that firms that remediate previously disclosed material weaknesses exhibit significant improvements in the public and private information precisions and market liquidity relative to ICW firms that fail remediate their control problems.

Because of the heavy burden of implementation of Section 404, the public firms argue that they focus on unnecessary controls over routine processes and calls for modification and extension (American Bankers Association, 2005; Financial Executives Institute, 2005; Powell, 2005). Therefore, as of October 2009, SOX 404 audit requirements for firms with less than $75 million in market capitalization (nonaccelerated filers) are scheduled to become effective for fiscal years ending on 2011. However, according to my findings, the implementation of Section 404 Act will enhance analysts' information quality and is more useful for market participants. The information contained in the internal control weakness disclosure is more informative to analysts and market participants, but absent internal control reports, users would not have known about the related control problems and the significant adjustment of

control activities. This evidence suggests that internal control reporting can reduce misunderstanding between a firm and users and can promote investment in the staff, policies, processes, and systems necessary to support quality of internal control reporting.

In sum, the disclosure of control problems under Section 404 can help users assess the risk of misleading financial reporting and the possibility of collusion. It also believes that firms will continue to strengthen accounting controls and invest in the infrastructure needed to support quality of internal control reporting. Such an analysis would provide useful evidence for weighing a potential benefit of Section 404 against the widely documented costs of such requirement.

Appendix: Examples of internal control disclosure

1. Examples of control weaknesses classification

1.1 Account-specific control weaknesses

Account-specific control weaknesses represent the weaknesses that relate to controls over specific account balances or transaction-level processes. The most common types of account-specific weaknesses relate to income taxes, accounts payable and accrued liabilities, revenues and related receivables, derivative instruments and leasing. Account-specific weaknesses generally involve complex areas or areas involving estimates, judgments and non-routine transactions or events, increasing the risk of error. Other frequent account-specific weaknesses such as inadequate internal controls for accounting for loss contingencies, deficiencies in the documentation of a receivables securitization, and non-adequate internal controls over the application of new accounting principles are presented in my hand-collated sample.

The examples of account-specific weakness disclosures in a firm's internal control opinion are shown as follows:

IKON Office Solutions, Inc

We have audited management's assessment, included in Management's Report on Internal Control over Financial Reporting appealing under Item 9A, that IKON Office Solutions, Inc. did not maintain effective internal control over financial reporting as of September 30, 2006, because the Company did not maintain effective controls over the accuracy and validity of revenue, accounts receivable and deferred revenue, based on criteria established in *Internal Control*.

[Omitting scope, definition and inherent limitations paragraphs]

A material weakness is a control deficiency, or combination of control deficiencies, that results in more than a remote likelihood that a material misstatement of the annual of interim financial statements will not be prevented or detected. The following material weakness has been identified and included in management's assessment. As of September 30, 2006 the Company did not maintain effective controls over the accuracy and validity of revenue, accounts receivable and deferred revenue. Specifically, the Company's controls over (1) the timely issuance of invoice adjustments, (2) the initiation of customer master records and contracts to ensure consistent billing of periodic charges, (3) the collection of accurate meter readings from equipment to ensure the accurate generation of customer invoices and (4) the segregation of incompatible duties within the billing function were deficient.

In our opinion, management's assessment that IKON Office Solutions, Inc, did not maintain effective internal control over financial reporting as of September 30, 2006, is fairly stated, in all material respects, based on criteria established Internal Control-Integrated Framework issued by the COSO. Also, in our opinion, because of the effect of the material weakness described above on the achievement of the objectives of the control criteria, IKON Office Solutions, Inc, has not maintained effective internal control over financial reporting as of September 30, 2006, based on the criteria established in Internal Control-Integrated Framework issued by the COSO.

Molson Coors Brewing Company

We have audited management's assessment, included in Management's Report on Internal Control over Financial Reporting appearing under Item 9A, that the Company did not maintain effective internal control over financial reporting as December 25, 2005 because the Company did not maintain effective controls over the completeness and accuracy of the income tax provision and related balance sheet

accounts, based on criteria established in *Internal Control.*

[Omitting scope, definition and inherent limitations paragraphs]

A material weakness is a control deficiency, or combination of control deficiencies, that results in more than likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected. The following material weakness has been identified and included in management's assessment. As of December 25, 2005, the Company did not maintain effective controls over the completeness and accuracy of the income tax provision and related balance sheet accounts. Specifically, the Company's controls over the processes and procedures related to the determination and review of the quarterly and annual tax provisions were not adequate to ensure that the income tax provision was prepared in accordance with generally accepted accounting principles.

In our opinion, management's assessment that Molson Coors Brewing Company did not maintain effective internal control over financial reporting as of December 25, 2005, is fairly stated, in all material respects, based on criteria established Internal Control-Integrated Framework issued by COSO. Also, in our opinion, because of the effect of the material weakness described above on the achievement of the objectives of the control criteria, Molson Coors Brewing Company has not maintained effective internal control over financial reporting as of December 25, 2005, based on the criteria established in Internal Control-Integrated Framework issued by COSO.

Corning Incorporated

We have audited management's assessment, include in Management's Report on Internal Control over Financial Reporting appearing under Item 9A, that Corning Incorporated did not maintain effective internal control over financial reporting as of December 31, 2005, because the Company (1) did not maintain effective controls over

the valuation of its asbestos settlement charges and the valuation and reconciliation of the related liability and (2) did not maintain effective controls over the completeness and accuracy of its equity investments, based on criteria established in Internal Control.

[Omitting scope, definition and inherent limitations paragraphs]

A material weakness is a control deficiency, or combination of control deficiencies, that results in more than likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected. The following material weakness has been identified and included in management's assessment at December 31, 2005:

(1) The Company did not maintain effective controls over the valuation of its asbestos settlement charges and the valuation and reconciliation of the related liability pertaining to the 2003. Specifically, the Company did not maintain effective controls to ensure that certain components of the liability, which may be settled by contributing the Company's equity.

(2) The Company did not maintain effective controls over the completeness and accuracy of its equity investments. Specifically, the Company did not maintain effective controls to ensure that earnings of its equity investments were accurately and completely recorded. This control deficiency resulted in the restatement of the Company's annual consolidated financial statements for the years ended December 31, 2005, 2004, and 2003.Additionally, this control deficiency could result in a misstatement of investments and equity in earnings of affiliated companies that would result in a material misstatement to the annual or interim consolidated financial statements that would not be prevented or detected.

In our opinion, management's assessment that Corning Incorporated did not maintain effective internal control over financial reporting as of December 31, 2005,

is fairly stated, in all material respects, based on criteria established Internal Control-Integrated Framework issued by COSO. Also, in our opinion, because of the effect of the material weakness described above on the achievement of the objectives of the control criteria, Corning Incorporated has not maintained effective internal control over financial reporting as of December 31, 2005, based on the criteria established in Internal Control-Integrated Framework issued by COSO.

2.2 Firm-level weaknesses

Firm-level weaknesses are defined as the weaknesses that related to firm-level controls, such as an ineffective control environment, weak overall financial reporting processes, or ineffective personnel and audit committee. The most common types of firm-level weaknesses relate to ineffective accounting personnel in company-wide functions, pervasive ineffective processes and stock-option backdating. Insufficient accounting skills and pervasive ineffective processes reflect an underinvestment in the infrastructure needed for quality reporting.

The examples of firm-level weakness disclosures in a firm's internal control opinion are shown as follows:

OfficeMax Incorporated

We have audited management's assessment, included in the accompanying Management's Report on Internal Control over Financial Reporting (Item 9A), the OfficeMax Incorporated did not maintain effective internal control over financial reporting as of December 31, 2004, because of the effect of a material weakness identified in management's assessment associated with the control environment of an entity acquired near the end of 2003, based on criteria established in *Internal Control*.

[Omitting scope, definition and inherent limitations paragraphs]

A material weakness is a control deficiency, or combination of control deficiencies, that results in more than a remote likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected. The following material weakness has be identified and included in management's assessment: As of December 31, 2004, deficiencies in the control environment of an entity acquired near the end of 2003 represented a material weakness in the internal control over financial reporting of OfficeMax Incorporated. This material weakness resulted from the combination of the following internal control deficiencies that, when aggregated, resulted in there being more than a remote likelihood that a material misstatement of the annual or interim financial statements would not be prevented or detected on a timely basis by management or employees in the normal course of performing their assigned functions: (1) insufficient policies and procedure to ensure that employees in the merchandising department of the acquired entity acted in accordance with the Company's Cod of Conduct, (2) insufficient policies and procedures regarding the follow-up on communications from vendor(s) regarding disputed claims, including the lack of adequate segregation of duties involving initiation of transactions and dispute resolution, and (3) inadequately trained personnel within the merchandising and accounting department.

In our opinion, management's assessment that OfficeMax Incorporated did not maintain effective internal control over financial reporting as of December 31, 2004, is fairly stated, in all material respects, based on criteria established Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Also, in our opinion, because of the effect of the material weakness described above on the achievement of the objectives of the control criteria, OfficeMax Incorporated has not maintained effective internal control over financial reporting as of December 31, 2004, based on the criteria established in

Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO)..

American International Group

We have audited management's assessment, included in the accompanying Management's Report on Internal Control over Financial Reporting under Item 9A, that AIG did not maintain effective internal control over financial reporting as of December 31, 2004 because of the effect of the material weaknesses relating to the (1) control environment, (2) controls over the evaluation of risk transfer, (3) controls over certain balance sheet reconciliations, (4) controls over accounting for certain derivative transactions and (2) controls over income tax accounting based on criteria established in Internal Control.

[Omitting scope, definition and inherent limitations paragraphs]

A material weakness is a control deficiency, or combination of control deficiencies, that results in more than a remote likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected. As of December 31, 2004, the following material weaknesses have been identified and included in management's assessment.

Control environment: Certain of AIG's controls within its control environment were not effective to prevent certain members of senior management, including the former Chief Executive Officer and former Chief Financial Officer, from having the ability, which in certain instances was utilized, to override certain controls and effect certain transactions and accounting entries. In certain of these instances, such transactions and accounting entries appear to have been largely motivated to achieve desired accounting results and were not properly accounted for in accordance with GAAP. Further, in certain of these instances, information critical to an effective

review of transactions, accounting entries, and certain entities used in there transactions and accounting entries, were not disclosed to the appropriate financial and accounting personnel, regulators and AIG's independent registered public accounting firm. As a result, discussion and thorough legal, accounting, actuarial or other professional analysis did not occur. This control deficiency is primarily on these overrides.

In our opinion, management's assessment that AIG did not maintain effective internal control over financial reporting as of December 31, 2004, is fairly stated, in all material respects, based on criteria established Internal Control-Integrated Framework issued by the COSO. Also, in our opinion, because of the effect of the material weakness described above on the achievement of the objectives of the control criteria, AIG has not maintained effective internal control over financial reporting as of December 31, 2004, based on the criteria established in Internal Control-Integrated Framework issued by the COSO.

Bausch & Lomb Incorporated

We have audited management's assessment, included in Management's Report on Internal Control over Financial Reporting appearing under *Item 9A Controls and Procedures*, that Bausch & Lomb Incorporated did not maintain effective internal control over financial reporting as of December 31, 2005, because (1) the Company did not maintain an effective control environment, (2) the Company did not maintain effective controls to provide reasonable assurance of the completeness and accuracy of certain financial statement accounts in certain subsidiaries, (3) the Company did not maintain effective controls over certain subsidiaries' relationship with their key distributors nor over the installation of refractive laser surgery equipment in multiple locations to ensure that revenue associated with such distributor and laser sales was

recognized in accordance with generally accepted accounting principles (GAAP), (4) the Company did not maintain effective controls over its accounting for income taxes and indirect taxes, including VAT and certain import related taxes related to its Brazilian subsidiary, and (5) the Company did not maintain effective controls to ensure that the Company's Deferred Compensation Plan document was amended to accurately reflect the Plan's intended design, based on criteria established in *Internal Control*.

[Omitting scope, definition and inherent limitations paragraphs]

A material weakness is a control deficiency, or combination of control deficiencies, that results in more than a remote likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected. The following material weaknesses have been identified and included in management's assessment as of December 31, 2005:

The Company did not maintain an effective control environment because of the following: (a) the Company did not adequately and consistently reinforce the importance of adherence to controls and the Company's cod of conduct, which contributed to certain of the restatement items that occurred across a broad range of the Company's operational and functional areas; (b) the Company failed to institute all elements of an effective program to help prevent and detect fraud by Company employees; (c) the Company did not establish and maintain effective corporate and regional management oversight and monitoring of operations to detect subsidiaries' managements' override of established financial controls and accounting policies, execution of improper transactions and accounting entries to impact revenue and earnings, and reporting of these transactions to the appropriate finance personnel or the Company's independent registered public accounting firm; and (d) the Company did not maintain a sufficient complement of personnel with an appropriate level of

knowledge, experience and training in the application of GAAP, including revenue recognition and accounting for income taxes, and in internal control over financial reporting commensurate with its financial requirement.

In our opinion, management's assessment that Bausch & Lomb Incorporated did not maintain effective internal control over financial reporting as of December 31, 2005, is fairly stated, in all material respects, based on criteria established Internal Control-Integrated Framework issued by the COSO. Also, in our opinion, because of the effect of the material weakness described above on the achievement of the objectives of the control criteria, Bausch & Lomb Incorporated has not maintained effective internal control over financial reporting as of December 31, 2005, based on the criteria established in Internal Control-Integrated Framework issued by the COSO.

2. Examples of effective internal control disclosure

The SEC defines internal control as "a process, effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the reliability of financial reporting." Section 404 Act only pertains to internal control associated to the reliability of financial reporting. The examples of the disclosure of effective internal control in a firm's internal control opinion are shown as follows:

Stage Stores Inc.

We have audited management's assessment, included in the accompanying Management's Annual Report on Internal Control over Financial Reporting, that the management of Stage Stores, Inc. and subsidiaries maintained effective internal control over financial reporting as of January 28, 2006, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring

Organizations of the Treadway Commission. The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting. Our responsibility is to express an opinion on management's assessment and an opinion on the effectiveness of the Company's internal control over financial reporting based on our audit.

[Omitting scope, definition and inherent limitations paragraphs]

In our opinion, management's assessment that the Company maintained effective internal control over financial reporting as of January 28, 2006, is fairly stated, in all material respects, based on the criteria established in Internal Control – Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of January 28, 2006, based on the criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission.

References

Affleck-Graves. J. Callahan, C. M., and Chipalkatti, N. 2002. Earnings predictability, information asymmetry, and market liquidity. *Journal of accounting research* 40, 561-583.

Aguilar, M. K. 2009. Drama! Intrigue! Congress and Section 404! *Compliance Weak* (October 30).

Ajinkya, B., S. Bhojraj and P. Sengupta. 2005. The association between outside directors, institutional investors and the properties of management earnings forecasts. *Journal of Accounting Research* 43: 343-376.

Ashbaugh-Skaife, H., D. W. Collins, W. R. Kinney Jr. 2007. The discovery and repoting of internal control deficiencies prior to SOX-mandated audits. *Journal of Accounting and Economics* 44: 166-192.

Ashbaugh-Skaife, H., D. W. Collins, W. R. and R. LaFond. 2008. The effect of SOX internal control deficiencies and their remediation on accrual quality. *The Accounting Review* 83: 217-250.

Ashbaugh-Skaife, H., D. W. Collins, W. R. and R. LaFond. 2009. The effect of SOX internal control deficiencies on firm risk and cost of equity. *Journal of Accounting research*, forthcoming.

Baginski, S. P. and Hassell J. M. 1997. Determinants of Management Forecast Precision. *The Accounting Review* 72: 303-312.

Bartov, E, F. Gul, and J. Tsui, 2000. Discretionary-accruals models and audit qualifications. *Journal of Accounting and Economics* 30, 421-452.

Barron, O. E., O. Kim, S. C. Lim and D. E. Stevens. 1998. Using analysts' forecasts to measure properties of analysts' information environment. *The Accounting Review* 73: 421-433.

Barron, O. E., D. Byard, C. Kile and J. R. Edvard. 2002. High-Technologh intangibles and analysts' forecast. *Journal of accounting Research* 40: 289-312.

Barron, O. E., D. G. Harris, and M. Stanford. 2005. Evidence that investors trade on private event-period information around earnings announcements. The Accounting Review 80: 403-421.

Bedard. J. 2006. Sarbanes Oxley internal control requirements and earnings quality. Laval University. *SSRN working paper*.

Beneish, M. D., M. B. Billings and L. D. Hodder. 2008. Internal control weaknesses and information uncertainty. *The Accounting Review* 83: 665-703.

Behn B. K., J. H. Choi and T. Kang. 2008. Audit quality and properties of analyst earnings forecasts. *The Accounting Review* 83: 327-349.

Bhattacharya, U., and M. Spiege., 1991. Outsider and market breakdowns. *Review of Financial Studies* 4, 255-282.

Bloomfield, R. and T. Wilks. 2000. Disclusure effects in the laboratory: liquidity, depth, and the cost of capital. *The Accounting Review* 75: 13-41.

Botosan, C. A., M. A. Plumlee, and Y. Xie. 2004. The role of information precision in determining the cost of equity capital. *Review of Accounting Studies* 9, 233-259.

Bradshaw, M., S. Richardson and R. Sloan, 2001.Do analysts and auditors use information in accruals? *Journal of Accounting Research* 39, 45-74.

Brennan, M. and A. Subrahmanyam. 1996. Market microstructure and asset pricing: on the compensation for illiquidity in stock returns. *Journal of Financial economics* 41: 441-464.

Burns, J. 2007. SEC sets sights on fine-tuning audit standards. *The Wall Street Journal.* (April 4): C8

Bushee, B. J., and C. Leuz. 2005. Economic consequences of SEC disclosure regulation: Evidence from the OTC bulletin board. *Journal of Accounting and Economics* 39: 233-264.

Byard D, and K. W. Shaw. 2003. Corporate disclosure quality and properties of

analysts' information environment. *Journal of Accounting Auditing and Finance* 18: 355-378.

Callahan, C., C. Lee, and T. L. Yohn. 1997. Commentary: Accounting information and bid-ask spreads. *Accounting Horizons* 11: 52-60.

Chan, K. C, B. R., Farrell, and P. Lee. 2008. Earnings management of firms reporting material internal control weaknesses under Section 404 of the Sarbanes-Oxley Act. *Auditing: A Journal of Practice & Theory* 27: 161-180.

Chang, H. C., H. L., Choy, W. W. Cooper, B. R. Parker, and T. W. Ruefli. 2009. Measuring productivity growth, technical progress, and efficiency changes of CPA firms prior to, and following the Sarbanes-Oxley Act. *Socio-Economic Planning Sciences* 43: 221-228.

Charles River Associates. 2005. Sarbanes Oxley Section 404 costs and remediation of deficiencies: Estimates from a sample of Fortune 1000 companies. April, 2005.

Chiyachantana, C. N., C. X. Jiang, N. Taechapiroontong, and R. A. Wood. 2004. The impact of Regulation Fair Disclosure on information asymmetry and trading: An intraday analysis. *The Financial Review* 39: 549-577.

Chung, K., T. McInish, R. Wood, and D. Wyhowski. 1995. Production of information, information asymmetry, and the bid-ask spread: Empirical evidence from analysts' forecasts. *Journal of Banking and Finance* 19: 1025-1046.

Clarkson, P. J. Guedes, and R. Thompson. 1996. On the diversification, observability, and measurement of estimation risk. *Journal of Financial and Quantitative Analysis* 31: 69-84.

Cores, J., Loewenstein, W. and J. Suay. 1995. On equilibrium pricing under parameter uncertainty. *Journal of Financial and Quantitative Analysis* 30: 347-364.

Cram, D. P., and V. Karan. 2009. Three threats to validity of choice-based and matched-sample studies in accounting research. *Contemporary Accounting*

Research 26: 477-516.

De Franco, G., Y. Guan, and H. Lu. 2005. The wealth change and redistribution effects of Sarbanes-Oxley internal control disclosures. *Working paper*, University of Toronto.

Dechow, P. and R. Sloan. 1997. Returns to contrarian investment: tests of the naïve expectations hypotheses. *Journal of Financial Economics* 43: 3-28.

Diamond, D. 1985. Optimal release of information by firms. *The Journal of Finance* 46: 1071-1094.

Diamond, D.and R. E. Verrecchia. 1991. Disclosure, liquidity, and the cost of capital. *The Journal of Finance* 46: 1325-1359.

Doss, M, and G. Jonas. 2004. Section 404 reports on internal control: impact on ratings will depend on nature of material weaknesses reported. Moody's Investors Service, Global Credit Research., October.

Doyle J., W. Ge and S. McVay. 2007a. Determinants of weaknesses in internal control over financial reporting. *Journal of Accounting and Economics* 44: 193-223.

Doyle J., W. Ge and S. McVay. 2007b. Accruals quality and internal control over financial reporting. *The Accounting Review* 82: 1141-1170.

Easley,D. and M. O'Hara.. 1992. Time and the Process of Security Price Adjustment. *The Journal of Finance* 47: 577-605.

Easley,D. and M. O'Hara. 2004. Information and the cost of capital. *Journal of Finance* 59: 1553-1583.

Easton, P. D. and M. E. Zmijewski. 1989. Cross-sectional variation in the stock market response to accounting earnings announcements. *Journal of Accounting and Economics* 11: 117-141.

Eleswarapu, V. R., R. Thompson, and K. Venkataraman. 2004. The impact of Regulation Fair Disclosure: Trading costs and information asymmetry. *Journal of Financial and Quantitative Analysis* 39: 209-225.

Fischer P. E. and Verrecchia R. E. 1998. Correlated Forecast Errors. *Journal of Accounting Research* 36: 91-110.

Francis, J., and J. Krishnan, 1999. Accounting accruals and auditor reporting conservatism. *Contemporary Accounting Research* 16: 135-165.

Ge, W., and S. McVay. 2005. The disclosure of material weaknesses in internal control after the Sarbanes-Oxley Act. *Accounting Horizons* 19: 137-158.

Glosten, L. and P. Milgrom. 1985. Bid, ask and transaction prices in a specialist market with heterogeneously informed traders. *Journal of Financial Economics* 14: 71-100.

Greene, W. H. *Econometric Analysis*. Fifth edition. Prentic Hall.

Gu, Z. 2004. Measuring the precision of analysts' private and common information: generalization and an application. *Working paper*. Carnegie Mellon University.

Hammersley, J. S., L. A. Myers, and C. Shakespeare. 2008. Market reactions to the disclosure of internal control weaknesses and to the characteristics of those weaknesses under Section 302 of the Sarbanes Oxley Act of 2002. *Review of Accounting Studies* 13: 141-165.

Harris, M and Raviv A. 1993. Differences of Opinion Make a Horse Race. *The Review of Financial Studies* 6: 473-506.

Healy, P. M. and K. G. Palepu. 2001. Information asymmetry, corporate disclosure, and the capital market: A review of the empirical disclosure literature. *Journal of Accounting and Economics* 31: 405-440.

Hoitash, R., U. Hoitash, and J. Bedard. 2005. Internal control quality and audit pricing under the Sarbanes-Oxley Act. *Working paper*, Suffolk University.

Hogan, C. E. and M. S. Wilkins. 2008. Evidence on the audit risk model: Do auditors

increase audit fees in the presence of internal control deficiencies? *Contemporary Accounting Research* 25: 219-242.

Hope, O. K. 2003a. Disclosure practices, enforcement of accounting standards, and analsyts' forecast accuracy: an international study. *Journal of Accounting Research* 41: 235-271.

Hope, O. K. 2003b. Accounting policy disclosures and analysts' forecasts. *Contemporary Accounting Research* 20: 295-321.

Holthanse, R. W., and R. E. Verrecchia. 1990. The effect of informedness and consensus on price and volume behavior. *The Accounting Review* 65: 191-208.

Kanagaretnam, K. G. J. Lobo, and D. J. Whalen. 2006. Are changes in public and private information precision related to changes in market liquidity around earnings announcements? *SSRN working paper*.

Kandel, E. and Pearson N. D. 1995. Differential Interpretation of Public Signals and Trade in Speculative Markets. *The Journal of Political Economy* 103: 831-872.

Kim, J. B., B. Y. Song, and L. Zhang. 2008. Internal control quality and analyst forecast behavior: Evidence from SOX Section 404 disclosure. 2008 American Accounting Association annual meeting, Anaheim, California.

Kim, O., and R. Verrecchia. 1994. Market liquidity and volume around earnings announcements. *Journal of Accounting and Economics* 19: 41-67.

Kim, O., and R. Verrecchia. 1997. Pre-announcement and event-period private information. *Journal of Accounting and Economics* 24: 395-419.

Kinney, W. 2000. Research opportunities in internal control quality and quality assurance. *Auditing: A Journal of Practice and Theory* 19: 83-90.

Krishnan, J., D. Rama, and Y. Zhang. 2008. Costs to comply with SOX section 404, *Auditing: A journal of practice and theory* 27: 169-186.

Kyle, A. 1985. Continuous auctions and insider trading. Econometrica 53: 1315-1335.

Lang, M. H. and R. J. Lundholm. 1996. Corporate disclosure policy and analyst

behavior. *The Accounting Review* 71:467-492.

Leuz, C. and R. Verrecchia. 2000. The economic consequences of increased disclosure. *Journal of Accounting Research* 35: 91-124.

Li C., K. H. Rupley and K. Johnstone. 2008. Internal governance, external governance, and internal control material weakness remediation. *2008 AAA auditing Section Midyear Meeting in Anaheim, CA.*

Li. C., L. Sun and M. L. Ettredge. 2007. Financial executive qualifications, financial executive turnover, and adverse SOX 404 opinions. *SSRN Working Paper.*

Libby, T., R. Mathieu, and S. W. G. Robb. 2002. Earnings announcements and information asymmetry: An intra-day analysis. *Contemporary Accounting Research* 19: 449-472.

Louis, H (2005). Acquirers' abnormal returns and the non-Big 4 auditor clientele effect. *Journal of Accounting and Economics* 40: 75-99.

Lundholm, R. J. 1988. Price-Signal Relations in the Presence of Correlated Public and Private Information. *Journal of Accounting Research* 26: 107-118.

McInish, T., and R. Wood. 1992. An analysis of intraday patterns in bid-ask spreads for NYSE stocks. *Journal of Finance* 47: 753-764.

Mohanram P. S. and S. V. Sunder .2006. How Has Regulation FD Affected the Operations of Financial Analysts? *Contemporary Accounting Research* 23: 491-525.

Moody's Investors Service (Moody's). 2006. *The second year of Section 404 reporting on internal control*. New York, NY: Moody's investors service.

Moody's Investors Service (Moody's). 2007. *The third year of Section 404 reporting on internal control*. New York, NY: Moody's investors service.

Ogneva, M., K. R. Subramanyam and K. Raghunandan. 2007. *The Accounting Review* 82: 1255-1297.

Powell, S. S. 2005. Costs of Sarbanes-Oxley are out of control. Letters to the editor. *Wall Street Journal* (March 21).

Public Company Accounting Oversight Board (PCAOB). 2004. *An audit of internal control over financial reporting performed in conjunction with an audit of financial statements*. Auditing Standard No. 2. Washington, D. C.

Public Company Accounting Oversight Board (PCAOB). 2007. *An audit of internal control over financial reporting that is integrated with and audit of financial statements.* Auditing Standard No. 5. Washington, D. C.

Raghunandan, K. and D. Rama. 2006. SOX Section 404 material weakness disclosures and audit fees. *Auditing: A Journal of Practice & Theory* 25: 99-114.

Ramnath, S., S. Rock, and P. Shane. 2008. The financial analyst forecasting literature: A taxonomy with suggestions for future research. *International Journal of Forecasting* 24: 34-74.

Roulstone, D. T., 2003. Analyst following and market liquidity. *Contemporary Accounting Research* 20: 551-578.

Schneider, A. and B. K. Church, 2008. The effect of auditors' internal control opinions on loan decisions. *Journal of Accounting and Public Policy* 27: 1-18.

Solomon, D. 2005. At what price? Critics say the cost of complying with Sarbanes-Oxley is a lot higher than it should be. Wall Street Journal (October 17).

Venkataraman, K., 2000. The role of an upstairs market in an electronic stock exchange, *Working paper*, Southern Methodist University.

Verrecchia, R. 1982. The use of mathematical models in financial accounting. *Journal of Accounting Research* 20: 201-242.

Welker, M. 1995. Disclosure policy, information asymmetry, and liquidity in equity markets. *Contemporary Accounting Research* 11: 801-827.

Whaley, R. E. 1993. Derivatives on market volatility: Hedging tools long overdue. Journal of Derivatives: 71-84.

Whaley, R. E. 2009. Understanding the VIX. *The Journal of Portfolio Management*

35: 98-105.

Xu, L. and A. P. Tang. 2009. Internal control material weakness, analysts' accuracy and bias, and brokerage reputation. Morgan State University. *SSRN working paper.*

Yohn, T. L. 1998. Information asymmetry around earnings announcements. *Review of Quantitative Finance and Accounting* 11: 165-182.