Enterprise Risk Management and Audit Efficiency

Abstract

This paper empirically investigates the effects of 'enterprise risk management' (ERM) on audit efficiency. Compared to internal control (IC), ERM addresses more than internal control (IC) and takes a holistic approach to manage all types of risks with the aim of improving the decision-making processes within a firm. Based on a sample of 466 firms with ERM disclosure information in 10-K and 10-Q filings between 2004 and 2014, we find that the implementation of ERM is associated with audit efficiency indicators – lower audit fees and shorter audit report lags – after controlling for the effectiveness of IC, proxied by disclosed IC weaknesses. These associations are further intensified after the introduction of Audit Standard No. 5 (AS5), which requires a top-down risk-based audit. In addition, we document the effects of ERM on firms remediating past IC weaknesses, which reduce both future audit fees and audit report lags. Overall, these findings suggest that the implementation of an ERM program improves audit efficiency in terms of audit costs and the timeliness of audit process.

Keywords: Enterprise risk management, ERM, Audit efficiency, Audit fee, Audit report lag

JEL Classification: D78; G28; G32; M41; M42.

Enterprise Risk Management and Audit Efficiency

I. INTRODUCTION

This paper provides empirical evidence on the positive association between the implementation of enterprise risk management (ERM) programs and audit efficiency. We find that the degree of ERM implementation is associated with two audit efficiency indicators – lower audit fees and shorter audit report lags – after controlling for the effectiveness of internal control (IC). Our analyses are motivated by the attributes of ERM that broadly cover and integrate risk management and corporate governance mechanisms, as well as the benefit of ERM in different aspects, such as firm value, performance, and financial reporting process.

ERM, designed as a holistic process and management control system for better decision making, employs a top-down, risk-based approach which facilitates risk management and alignment in an integrated, enterprise-wide fashion (Hoyt and Liebenberg 2011; Baxter, Bedard, Hoitash, and Yezegel 2013). Because the implementation and disclosure of ERM are not mandatory, prior literature summarizes certain examples as the indicators of ERM utilization, such as the integration of risk strategies, the employment of a holistic risk management approach, the appointment of chief risk officer (CRO), and the establishment of an independent risk committee in the board of directors (Hoyt and Liebenberg 2011).

ERM and IC should be interconnected but not interchangeable (Chesley, Pett, and Martens 2016). The process of IC complements ERM by focusing at operational level to provide reasonable assurance for an entity to understand its risks and achieve various goals, while ERM integrates the operational, financial reporting, and compliance objectives and elevates the focus to strategic level in order to form a broader and more robust conceptualization and tool for risk management. ERM aims to achieve an entity's objectives set in four categories, including strategic goals, operations,

reporting, and compliance (COSO 2004, 2016a).

The success of ERM should rely on IC at critical junctures since effective controls can ensure that risk responses are carried out properly throughout the entity. The effect of IC on audit work has been examined in prior literature (e.g. Ettredge, Li, and Sun 2006; Hogan and Wilkins 2008; Munsif. Raghunandan, Rama, and Singhvi 2011, etc). In general, material IC weaknesses are found to be associated with higher audit fees and longer audit delay. Nevertheless, how ERM interacts with IC and affects external audit behavior remains unclear. Desender and Lafuente (2010) provided preliminary evidence that ERM is negatively associated with audit fees, but the study relies on a survey data of only 97 observations in 2004 collected from the pharmaceutical industry. Considering the distinction between ERM and IC, we control for IC effectiveness to explore the roles of ERM on external audit work with four research questions pertaining to audit efficiency, with audit fees and audit report lags as its proxies, and provide more generalized results.

We construct the measure of ERM implementation and rely on a cross-industry dataset covering the period between 2004 and 2014 to examine the following four specific questions. First, we examine the association between the implementation of an ERM program and audit fees. Second, we investigate the association between ERM implementation and audit report lags. Third, we examine whether Audit Standard No. 5 (AS5), introduced in June 2007 to require a top-down risk-based audit, affects the relation between ERM and audit efficiency. Fourth, we take previous detected IC weaknesses into account to investigate whether ERM implementation affects audit efficiency in firms remediating past IC weaknesses.

We use text-search techniques to collect ERM information from the U.S. Securities and Exchange Commission (SEC) 10-K and 10-Q filings. To account for different level of investment and implementation in ERM, we examine whether (i) a firm employs a holistic process,

framework, or strategies for risk management; (ii) a firm specifically sets up a CRO position in the senior management team; (iii) the board of directors of a firm includes an independent risk committee to oversee risk management policies. We assign one point for each condition respectively to construct a measure (score 0-3) for each firm-year's relative degree of ERM (score 0-3) implementation. Our final sample consists with 466 non-financial firms (a total of 4,517 firm-year observations) across different industries from 2004 to 2014. In the dataset, firms in the electronic equipment industry (SIC 36) are most common (35.53%) ERM adopters. The breakdown by sample year shows that the implementation rates of ERM increase steadily from 22.78% to 35.45% during our sample period.

Our main findings are summarized as follows. First, we document that ERM implementation is significantly and negatively associated with both current and one-year-ahead audit fees and audit report lags. The results are explained from the perspective of audit efficiency. Auditors benefit from the information provided by ERM framework and therefore can reduce the workload in the assessment of audit risks as well as other fieldwork. The mitigation of audit risk and planned audit work overall lead to lower audit fees and timely filing of audit report. Consistent with prior studies, we also find that the presence of material IC weaknesses is related to higher audit fees and longer audit report lags. Second, we find that ERM implementation is more negatively associated with audit fees and audit report lags in the post-AS5 period, confirming the incremental effect of ERM on the improvement of audit efficiency following the enactment of AS5. Third, we provide evidence that ERM implementation can further reduce future audit fees and audit report lags for firms remediating their past material IC weaknesses.

Our empirical work shed lights on the value of ERM implementation for regulators, firm policy makers and other entities, to the extent how they could benefit more from ERM

framework.[1] This paper also provides important implications for the auditing practice. Based on our findings, auditors rely on information provided by ERM can better perform a top-down risk-based audit in light of the requirements of AS5. The remainder of this paper is organized as follows. Section II introduces the background of ERM and related literature to develop our four main hypotheses. Section III includes our research methodology, sample and descriptive statistics. Section IV presents the empirical results of our main analyses and additional tests. Section V summarizes our main findings and conclusions.

II. BACKGROUND AND HYPOTHESES

ERM is a holistic program embedded in the strategic decision-making processes that aligns or manages risks from a wide variety of sources (Baxter et al. 2013) and reduces operational uncertainties. While there is no universal definition or implementation, ERM is applied from strategy through execution and relies on IC at critical junctures (Chesley et al. 2016). It involves each business function to lower the risks and bring different benefits to the entire organization, such as improving strategic and capital structure decision-making (Chapman 2006), reducing the probability of large cash-flow shortfalls (Nocco and Stulz 2006), lowering stock return volatility (Eckles, Hoyt, and Miller 2014; Ittner and Keusch, 2016) and improving risk governance (Lundqvist 2015). One for the most widely accepted ERM frameworks proposed by the Committee of the Sponsoring Organizations of the Treadway Commission (COSO) shows that ERM framework is geared to achieve an entity's objectives in four main categories, including: (i) Strataegy — high-level goals aligned with and supporting its mission; (ii) Operations — effective

[1] ERM is also useful for the public sector. For instance, the Office of Management and Budget (OMB) issued an updated circular in July 2016 requiring federal agencies to implement ERM to ensure federal managers are effectively managing risks that could affect the achievement of agency strategic objectives (GAO 2016).

and efficient use of business resources; (iii) Reporting — reliability of reporting; and (iv) Compliance — compliance with applicable laws and regulations. This framework incorporate COSO's (2013) IC framework, which is primarily used for internal control over financial reporting (ICFR), yet encompasses three main categories, including operation, overall reporting, and compliance (COSO, 2013). In summary, ERM and IC are interconnected as powerful complement in supporting management (Chesley et al. 2016).

IC is crucial to a firm's success because it is relevant to firm's financial reporting and daily operations. The Sarbanes-Oxley Act (SOX) Section 404 requires both managers and auditors to assess and publicly disclose the effectiveness of firm's ICFR (Deloitte & Touche, Ernst & Young, KPMG and PricewaterhouseCoopers 2004). This requirement was effective to accelerated filers in 2004.[2] If material IC weaknesses are detected, external auditors have to exert more efforts in verifying financial information to mitigate potential risks in the audit process. Prior research has found that firms disclosing material IC weaknesses are often associated with lower audit efficiency, resulting in higher audit fees and longer audit report lags (Hogan and Wilkins 2008; Krishnan, Rama, and Zhang 2008; Munsif et al. 2011; Ettredge et al. 2006; Givoly and Palmon 1982). Audit report lags, for example, induce asymmetrical information between insiders and the public, as well as negative implication of the firm (Hakansson 1977; Chambers and Penman 1984). Studies also find that such negative impact of material IC weaknesses on audit efficiency can persist over multiple periods (Hoitash, Hoitash, and Bedard 2008; Bedard, Hoitash and Hoitash. 2008; Munsif et al. 2011, 2012).

Besides material IC weakness, factors affecting audit efficiency include the systematic change of reporting requirement and the quality of internal audit function. After the implementation of SOX Section 404, audit delay has increased significantly (Ettredge et al. 2006;

[2] This requirement was postponed until 2007 and was exempt by Dodd-Frank Act in 2010 for non-accelerated filers

Bronson, Hogan and Johnson 2011). Both audit delay and audit fees decreased with the enactment of AS5 (Jian and Wu 2009; Doogar, Sivadasan, and Solomon, 2010; Krishnan, Krishnan, and Song 2011; Wang and Zhou 2012), particularly for firms with clean SOX Section 404 opinions (Mitra, Song and Yang 2015) and firms without contaminating audit quality (Wang and Zhou 2012, Mitra et al. 2015). In addition, the decrease in audit delay can be attributed to an effective internal audit function which helps reduce the likelihood of IC weaknesses and provides better information to aid external auditors' work (Pizzini, Lin and Ziegenfuss 2015).

When firm commits to construct a set of high-quality corporate governance, the effectiveness and efficiency of both IC and internal audit become the focus that may lead to competing effects on audit fees. On the one hand, given firm resources are limited, more efforts placed on enhancing IC or corporate governance may reduce the resources available for external audit. Better governance is expected to lower the control risk and essential tasks required from auditors. Hence, auditors may have better efficiency, charge lower audit fees, and file audit report sooner.[3] On the other hand, external audit work can be considered as complement instead of substitute for corporate governance.[4] A firm placing emphasis on IC and corporate governance could be more willing to pay higher audit fees, hire the most qualified auditors, and ask for more audit efforts at the same time to mitigate firm risks. In this case, better IC will be associated with higher audit fees and longer audit report lags.

Whilst the association between IC effectiveness and audit fees has been well documented in prior literature, few studies have empirically examined the relationship between ERM and audit or financial reporting process. ERM expands and elaborates IC to form a more robust and risk-oriented

[3] See, for example, Simunic (1980, 1984); Wallace (1984); Felix, et al. (2001); and Goodwin-Stewart and Kent (2006).

[4] See, for example, Hay, Knechel and Ling (2008); Collier and Gregory (1996); O'Sullivan (2000); Carcello, Hermanson, Neal, and Riley (2002); and Abbott, Parker, Peters, and Raghunandan (2003).

conceptualization (COSO 2004, 2013, 2016a). It could mitigate firm risks to affect external audit through the following channels: (i) the alignment of operational risks to reduce the uncertainty of firm performance, and therefore to mitigate the inherent risk; (ii) the improvement of IC and financial reporting quality to reduce the control risk; and (iii) the improvement of information transparency and effective internal and external communication. The information provided by the ERM framework therefore may help auditors to alleviate the workload of substantial tests and reduce audit fees as well as audit report lags. However, since the implementation of ERM is not mandatory, firms choosing to introduce ERM framework may be more risk averse and would like to obtain better audit quality. As a result, the audit fees and audit report lags may increase with the utilization of ERM.

Considering that IC and ERM complement each other (COSO 2016b), we follow the stream of studies documenting the negative effects of material IC weakness on audit efficiency to make the first hypothesis as follows:

H1: *After controlling for the effectiveness of IC, the implementation of an ERM program has a negative relation with audit fees.*

Besides audit fees, an alternative measure, audit report lags, is often employed as the proxy for audit efficiency and linked to IC. The requirement of mandating auditors to issue an opinion on management's IC assessment has been proved to increase the workload of auditors. Krishnan and Yang (2009) documented that after such requirement was established under SOX Section 404, there was a significant increase in audit report lags. In addition, a firm's quality or effectiveness of IC is also a determinant of overall audit efficiency. Better IC can reduce audit effort and therefore shorten audit lags (Knechel and Payne 2001) whereas the presence of material weaknesses, especially systemic material weaknesses found in ICFR, is associated with longer audit delays (Ettredge et al.

2006). The objectives of IC are incorporated in ERM, we accordingly predict consistent effects of the two components on the timeliness of audit process and make the second hypothesis with regard to audit report lags:

H2: *After controlling for the effectiveness of internal control, the implementation of an ERM program has a negative relation with audit lags.*

Prior research documents that the update for AS5 from Audit Standard No. 2 (AS2) in June 2007 leads to a reduction of audit fees (Jiang and Wu 2009; Doogar et al. 2010; Krishnan et al. 2011) and audit lags (Mitra et al. 2015) without compromising audit quality. Such improvement can be attributed to the top-down, risk-based approach introduced by AS5, which allows auditors to rely on information provided by firms' internal sources such as internal auditors or the management. Internal auditors play an important role in the ERM framework by providing assurance on risk evaluation and management process, as well as reviewing the reporting risk. Although internal auditors provide advices for management's decision-making, the management still holds the responsibility for firm's risk strategy. In this case, ERM can assist managers in keeping firm disclosure process fresh through a process-based chain of accountability that involves unit managers and process owners, and identifying issues requiring actions and possible disclosures (Protiviti 2006). With AS5's emphasis on the top-down, risk-based approach, the information generated or integrated through ERM framework and provided by the internal personnel of a firm should be more valuable to auditors and the audit workload could be reduced. Therefore, we expect to find the incremental effect of ERM on audit efficiency and make our third hypothesis:

H3(a): *After controlling for the effectiveness of IC, firm implementing an ERM program has lower audit fees in AS5 years.*

(b): *After controlling for the effectiveness of IC, firm implementing an ERM program has lower audit report lags in AS5 years.*

For firms that successfully remediate their prior documented IC weaknesses, both their audit fees and audit report lags are expected to fall back to a normal level in the long run. Such long-term effect is generally supported by prior research because the remediation of IC problems help reduce the cost of equity (Ashbaugh-Skaife, Collins and Kinney 2009), improve corporate governance and management characteristics (Johnstone, Li, and Rupley 2011), and reduce volatility in management forecasts (Feng et al. 2009). In the short-term, however, remediating firms continue to pay audit fee premium (Hoag and Hollingsworth 2011; Munsif et al. 2011) and experience longer audit lags than firms never have IC issues (Munsif et al. 2012) since extra audit effort is still needed for verification purpose during the period of IC remediation. In addition, firms with recent history of IC problems have sticky audit fees. On average, firms with recent detected IC weaknesses continue to pay higher audit fee premium for another two years after remediation (Munsif et al. 2011) as a form of risk premium to compensate risks arise from IC weaknesses. Similarly, audit lags do not reduce to normal level immediately after the remediation, and only accelerated filers experience a significant reduction of audit lags after the remediation (Munsif et al. 2012).

Although ERM is not required under SOX Section 404, it could facilitate the compliance with applicable laws and regulations, identify and respond to emerging risks in a timely manner, and disclose related information in a more systematic way. An effective ERM can reduce audit effort by providing auditors with greater information and confidence in identifying potential disclosure weaknesses. When IC and ERM complement each other, the remediation of IC weaknesses should help to improve the effectiveness of ERM. As a result, in the fourth hypothesis we control for IC to investigate the effects of ERM on firms' audit fees and audit lags after remediation:

H4(a): *For firms remediating previous material internal control weaknesses, the implementation of an ERM program is associated with lower audit fees.*

(b): *For firms remediating previous material internal control weaknesses, the implementation of an ERM program is associated with lower audit lags.*

III. METHODOLOGY AND DATA

Research Methodology

We construct the following model to examine the first hypothesis in terms of the association between audit fees and relative ERM implementation:

$$AFEE_{it} = \alpha_0 + \alpha_1 ERMS_{it} + \alpha_2 ICW_{it} + \alpha_3 ERMS_{it} * ICW_{it} + \alpha_4 SIZE_{it} + \alpha_5 ROA_{it} + \alpha_6 MTB_{it} + \alpha_7 SQRTSEG_{it} + \alpha_8 LEV_{it} + \alpha_9 GC_{it} + \alpha_{10} DACC_{it} + \alpha_{11} SPI_{it} + \alpha_{12} RESTATE_{it} + \alpha_{13} CGI_{it} + \alpha_{14} BIG4_{it} + \alpha_{15} CHANGE_{it} + \varepsilon_{it} \quad (1)$$

where:

$AFEE_{it}$ = Natural logarithm of audit fees in thousands.
$ERMS_{it}$ = A firm-year's relative degree of implementing enterprise risk management (score 0-3) based on three conditions, including: (i) employing a holistic process and framework for risk management; (ii) specifically setting up a chief risk officer (CRO) in the senior management team; and (iii) the board of directors includes an independent risk committee to oversee a firm's risk management policies. Each condition is assigned one point respectively.
ICW_{it} = An indicator equal to one if the firm-year has an internal control weakness, and zero otherwise.
$SIZE_{it}$ = Natural logarithm of total assets at the beginning of year *t*.
ROA_{it} = Return on total assets, which equals income before extraordinary items divided by total assets at the beginning of year *t*.
MTB_{it} = Market-to-book ratio.
$SQRTSEG_{it}$ = Square root of the number of business segments.
LEV_{it} = Leverage, which is equal to long-term debt divided by total assets at the beginning of year *t*.
GC_{it} = An indicator equal to one for firms with going concern modified opinion and zero otherwise.
$DACC_{it}$ = Absolute value of performance-adjusted abnormal accruals based on Kothari et al.

(2005).
SPI_{it} = An indicator equal to one if firm reports special items and zero otherwise.
$RESTATE_{it}$ = An indicator equal to one if firm discloses a restatement and zero otherwise.
CGI_{it} = Corporate governance score (percentile).
$BIG4_{it}$ = An indicator equal to one for big four accounting firm and zero otherwise.
$CHANGE_{it}$ = An indicator equal to one if there is a change in auditor and zero otherwise.

The subscript *i* denotes the firm and the subscript *t* refers to the fiscal year.

Our main variable of interest is the ERM implementation score, $ERMS_{it}$. Prior research (Hoyt and Liebenberg 2011) uses an indicator to identify ERM activities for each firm-year through a detailed search of financial report, newswires and other databases. The keywords include 'enterprise risk management,' 'chief risk officer,' 'risk committee,' 'strategic risk management,' and other related terms. However, this method may not fully capture the extent of ERM implementation that has been placed within firms. We therefore construct the ERM score ranging from 0 to 3 for each firm-year's relative degree of implementing ERM based on three conditions: (i) the implementation of holistic risk management; (ii) the appointment of CRO; and (iii) the existence of risk committee on the board of directors. We assign one point for each condition to construct the ERM score for each firm-year.[5] Prior literature elaborating the relations between ERM and IC suggests that these elements should be complementary and interconnected, but not interchangeable (Chesley et al. 2016). We therefore control for the effectiveness of IC through the indicator ICW_{it} and address its interaction with ERM implementation. Other control variables are proxies for firm size ($SIZE_{it}$), performance (ROA_{it}, MTB_{it}), complexity ($SQRTSEG_{it}$), financial condition (LEV_{it}, GC_{it}), reporting behavior ($DACC_{it}$, SPI_{it}, $RESTATE_{it}$), governance (CGI_{it}) and auditor attributes ($BIG4_{it}$, $CHANGE_{it}$). In addition, we winsorize all continuous variables at upper

[5] We acknowledge that these criteria may not reflect the completeness or quality of ERM implementation. Firms may set multiple risk management policies or techniques without adequate implementation or explicit disclosure. We therefore use the ERM indicator, ERM_{it}, as an alternate to identify firm-year meeting any of the three conditions and perform each analysis. Most empirical results (untabulated) are similar and consistently support the main conclusions. We also employ multiple robustness checks to alleviate this concern.

and lower 1 percentile to mitigate the effects from outliers.

Another proxy for the quality and efficiency of audit work used in prior studies is audit report lag. Following the research model in Munsif et al. (2012) we examine the second hypotheses (H2) with regard to the association between audit report lags and relative ERM implementation:

$$AULAG_{it} = \beta_0 + \beta_1 ERMS_{it} + \beta_2 ICW_{it} + \beta_3 ERMS_{it} * ICW_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 SQRTREG_{it} + \beta_7 LEV_{it} + \beta_8 GC_{it} + \beta_9 DACC_{it} + \beta_{10} SPI_{it} + \beta_{11} RESTATE_{it} + \beta_{12} CGI_{it} + \beta_{13} CHANGE_{it} + \beta_{14} AFEE_{it} + \gamma_{it} \quad (2)$$

where $AULAG_{it}$ represents the natural logarithm of the number of calendar days from the fiscal year-end date to auditor's report date. Shorter audit report lag implies better audit efficiency. The definitions of most control variables are included in the discussion of Equation (1). We adjust model combinations and include the audit fees ($AFEE_{it}$) as an additional control variable.

Data and Descriptive Statistics

Considering the interrelation between ERM and IC (COSO 2004, Chesley et al. 2016), our sample period starts from 2004, the year that SOX Section 404 required IC assessment to be carried out by an external auditor, towards 2014. We require the firm-year observations consecutively exist during the sample period in the initial step of sample selection as a result of time-consuming establishment and long-term effects of ERM. We retrieve financial data from *Compustat North America*, exclude firms in financial industry, and combine the dataset with the data in *CRSP* for market value information.[6] Subsequently, we match the sample with the dataset extracted from *Audit Analytics* for audit fee, audit opinion, and other auditing attributes. We then drop

[6] We exclude financial firms since the incentive of utilizing ERM in these firms is different. The effects and implementation of ERM in financial firms therefore could be different from other firms. For instance, the National Association of Insurance Commissioners (NAIC) adopted the Risk Management and Own Risk and Solvency Assessment Model Act on Sept. 12, 2012 that requires insurance companies to issue their own assessment of the current and future risk, and is expected to be adopted by all states by the end of 2017.

non-accelerated filers (firms with market capitalization lower than $75 million) as these firms were exempt from the auditor attestation requirement for ICFR by Dodd-Frank Act in 2010. In the end we obtain a dataset with 5,548 firm-year (638 firms) observations ready to match ERM information.

Given the lack of a universal definition and regulatory requirement for ERM, there are no consistent methods to determine the implementation, completeness or quality of ERM. Prior studies used survey data (Altuntas, Berry-Stölzle, and Hoyt 2011; Grace, Leverty, Phillips, and Shimpi 2015) or specific database, such as Standard & Poor's (S&P) ERM ratings for financial firms (McShane et al. 2011; Baxter et al. 2013), to retrieve the information of ERM implementation, but they were limited to small sample size or specific industries. Other research applied text search techniques (Hoyt and Liebenberg 2011; Eckles et al. 2014) to examine keywords or terms from financial reports, newswires, and other disclosures and identify ERM activities.

We follow the latter approach to search SEC 10-K and/or 10-Q filings on whether: (i) a firm discloses its implementation of an ERM program or employs a holistic approach, techniques or strategies for risk management; (ii) a firm specifically appoints a CRO in the senior/executive management team; and (iii) the board of directors of a firm sets an independent risk committee to oversee risk management policies and framework. Based on our analyses, in 10-K filings firms often disclose information of risk strategies or risk management policies in Item 1A regarding risk factors or business risks. Additionally, some firms disclose risk information in Item 4. The information about the appointment of CRO or risk committee, if any, is generally available in the paragraphs related to executive officers or committee members. The examples for each condition regarding disclosure and implementation of ERM are listed in Appendix B.

Following the research design, we create the indicator, ERM_{it}, to identify firm-year observations that meet any of the three aforesaid conditions and the ERM implementation score,

$ERMS_{it}$, ranging from 0 to 3 to measure firm-year observations meeting the number of three conditions. After excluding missing data in interested and control variables, our final sample consists of 4,517 firm-year (466 firms) observations. The procedure of sample selection in detail is presented in Table 1.

<Tables 1 is inserted about here>

Table 2 summarizes the sample composition by industry and years as well as the respective rates of implementing ERM. Table 2, Panel A, lists the distribution of ERM implementation for firm-year within the top ten industries, which take 63.16% in the sample. Firms in electronic equipment (SIC 36), transportation (SIC 37), and business services (SIC 73) take the highest rates to implement ERM, which are 35.53%, 35.14%, and 33.18% respectively across the period between 2004 and 2014. Table 2, Panel B, presents sample breakdown by year. The implementation rate of ERM increases steadily during the sample period from 22.78% to 35.45%. The average rate of ERM implementation over the sample period is 28.49% and higher than the findings in prior literature.[7] The potential explanations are as follows. First, our sample period covers the years after 2009. SEC (2009) final rule 33-9089 effective in February 2010 required the disclosure of the enhancement of information regarding risk-related management control systems, increased the transparency of the board's risk oversight responsibility and improved firm disclosure in risk management (Edmonds, Edmonds, Leece, and Vermeer, 2015). Second, firms may place more emphasis on risk management and ERM implementation after 2007-08 global financial crisis. In our study, the ERM implementation rate in 2014 was 35.45%, which is comparable with the latest survey done by Beasley et al. (2016) and KPMG (Allocca 2017).[8]

[7] For instance, Hoyt and Liebenberg (2011) examined the implementation of ERM in insurance industry and found an increase in ERM adopters from less than 5 percent in 1998 to more than 20 percent in 2005.

[8] According to the latest survey of American Institute of Certified Public Accountant (AICPA) made by Beasley et al. (2016), 25 percent of the sample firms claimed to have complete ERM process and 51 percent of public firms

<Tables 2 is inserted about here>

Table 3, Panel A provides the descriptive statistics of all variables and the comparison between ERM and non-ERM adopters. In general, firms implementing ERM have both lower audit fees and shorter audit report lags, indicating auditors of these firms have less workload and better efficiency than those of firms without ERM. ERM adopters also have fewer IC weaknesses (ICW_{it}), larger size ($SIZE_{it}$), better performance measured by return on assets (ROA_{it}), and greater number of segments ($SQRTSEG_{it}$). In addition, as compared to non-ERM adopters, firms with ERM have fewer going concern (GC_{it}) issues, lower magnitude of discretionary accruals ($DACC_{it}$), lower probability of restatement ($RESTATE_{it}$), and better corporate governance (CGI_{it}). These results are consistent with prior literature (Hoyt and Liebenberg 2011, Gao et al. 2016) to reflect the demand of ERM in firms with certain attributes, such as larger size and greater diversification, as well as the effects or benefit of ERM, such as lower leverage and better accounting quality. For auditor attributes, firms implementing ERM tend to appoint auditors from big-four accounting firms ($BIG4_{it}$) and are less likely to switch auditors ($CHANGE_{it}$).

We further analyze the 88 firm-year disclosing material IC weaknesses in the sample and find only 11 firm-year implementing ERM. The implementation rate is 14.29% and the mean of ERM score ($ERMS_{it}$) is 1.170, which is lower than the implementation rate (28.81%, 1,276 out of 4,429 observations) and mean of ERM score (1.299) for firm-year without material IC weaknesses.

The Pearson correlations between the main variables are reported in Table 3, Panel B, which show that both ERM implementation (ERM_{it}) and ERM scores ($ERMS_{it}$) are negatively correlated with the dependent variables ($AFEE_{it}$ and $AULAG_{it}$) while the material IC weakness (ICW_{it}) is

claimed to have complete ERM process in place. Based on a survey of 832 audit committee members, KPMG 2017 Global Audit Committee Pulse also shows that 38% members say their company has a robust risk management system in place, while 42% say the substantial improvement on the company's risk management system is required. In addition, 41% say the top challenge for audit committee in 2017 should be the effectiveness of risk management program.

positively associated with the dependent variables.

<Tables 3 is inserted about here>

IV. EMPIRICAL RESULTS AND ANALYSIS

Main Empirical Results

The first column of Table 4 presents the results of regressing contemporaneous audit fees on relative ERM implementation ($ERMS_{it}$), IC effectiveness (ICW_{it}), and other controls. After controlling for firm and auditor characteristics, the coefficient on $ERMS_{it}$ is -0.265 (t-value: -2.61), which is supportive to our first hypothesis (H1) and suggests that ERM implementation is related to lower audit fees ($AFEE_{it}$). The result is consistent with the following arguments. First, when ERM is effectively implemented, it builds up a framework to identify and manage various risks and provides a common language for different internal and external parties. Auditors therefore can retrieve information from client's ERM program to better identify and evaluate firm risks, improve the efficiency of the planned audit work, and ultimately charge lower audit fees. Second, with limited resources, a firm introducing ERM and devoting resources into corporate governance may not be able to allocate more resources to external audit. While audit quality does not necessarily decrease, given the resource constraint, the audit fees are reduced.

On the other hand, the coefficient on ICW_{it} is significantly positive (0.801, t-value: 2.83), suggesting that material IC weakness is associated with higher audit fee. The finding is consistent with prior literature (Raghunandan and Rama 2006, Hogan and Wilkins 2008, Krish et al. 2008) documenting that firms disclosing material IC weaknesses in their Section 404 reports pay higher audit fees. The coefficient on the interaction term, $ERMS_{it}*ICW_{it}$, is small and weakly positive

(0.016, t-value: 1.68). To verify the effect of ERM program, we take the partial derivative of the model with respect to $ERMS_{it}$ and retrieve the estimated coefficient on ICW_{it}, of 0.016 with intercept term of -0.265, suggesting that when firms (do not) present IC weakness, $ERMS_{it}$ reduces audit fee by (0.265) 0.249. Conversely, if we take partial derivative on ICW_{it}, the estimated coefficient on $ERMS_{it}$ is 0.016, with intercept term of 0.801, suggesting that for firms without (with) ERM, ICW_{it} increases audit fee by 0.801 (greater than 0.801). The above analysis supports the argument that ERM and IC complement each other (COSO 2016b; Chesley et al. 2016): for firms exhibit IC weakness, implementing ERM helps to reduce audit fee; for firms who have already implemented ERM, exhibiting IC weakness may imply firm's accounting report is no longer trust worthy and therefore is interpreted as a red flag by auditors, who will then require a more thorough and careful investigation into the firms' account, which further increases audit fee[9].

The establishment and introduction of ERM take time for realizing its effects, we therefore use one-year-ahead model to examine whether the implementation of ERM can reduce future audit costs. In the second column of Table 4, $ERMS_{it}$ is still negatively associated with one-year-ahead audit fees and the coefficient magnitude increases (coefficient: -0.310, t-value: -2.07). The coefficient on ICW_{it} remains positive (1.296, t-value: 3.15), which is consistent with the findings in prior literature that firms reporting IC weaknesses continue to pay higher audit fees (Hammersley, Myers, and Zhou 2009; Munsif et al. 2011) regardless of their remediation actions for at least two years. However, the interaction term $ERMS_{it}*ICW_{it}$ is not significant. Most control variables are significant and consistent with our expectations and prior studies except $RESTATE_{it}$ and $CHANGE_{it}$, indicating firms with larger size, better performance, greater complexity, higher leverage, and

[9] Another alternative method is to separate the sample based on ICW_{it} and make separate analyses. We therefore revise the models by excluding the interaction term, $ERMS_{it}*ICW_{it}$, and rerun each test in the following. Most (untabulated) results show that without material IC weaknesses, the implementation of ERM is associated with lower audit fees and audit report lags, consistent with our main findings. Conversely, for firms disclosing material IC weaknesses, $ERMS_{it}$ is not significant in most cases.

more aggressive reporting behavior tend to pay higher audit fees while those with better corporate governance pay lower audit fees. In addition, auditors from big four accounting firms often charge higher audit fees.

<Tables 4 is inserted about here>

While our finding of the negative association between ERM implementation and audit fee is consistent with prior literature (Desender and Lafuente 2010), it may not directly reflect the effects of ERM on auditors' working efficiency since audit fee is determined by various factors. As a result, we further test the association between the relative ERM implementation and audit report lags and present the results in Table 5. The regression results of the contemporaneous model are shown in the first column. The coefficient on $ERMS_{it}$, is significantly negative (-0.187, t-value: -4.88), implying that firms implementing ERM are associated with lower audit report lags. This result is consistent with our second hypothesis (H2) and provides further evidence regarding the effects of ERM in alleviating auditors' workload. Conversely, the coefficient on ICW_{it} is significantly positive (0.241, t-value: 6.44) and consistent with the findings in prior literature (Munsif et al. 2012), suggesting that the presence of IC weaknesses affects the extent of auditor's planned work. As the result of potential exposure to higher control risk, auditors would be more careful and lead to more audit effort and longer report lags. We also include the interaction term, $ERMS_{it}*ICW_{it}$ in the model. The positive coefficient (0.037, t-value: 2.13) suggests that ERM cannot help mitigate audit report lags for firms with material IC weakness. The reliability of information provided by the ERM program is questionable without effective IC and auditors would not rely on ERM to make risk assessment and improve their working efficiency. Most control variables are significant and consistent with prior studies. Firms with higher complexity, higher leverage, more discretionary accruals, more accounting events, and auditor change will

demand more works from auditors and cause greater audit report lags. Conversely, audit report lags tend to be lower for firms with larger size and better corporate governance. One possible explanation is that larger firms will have more resources invested in their accounting and control systems for preparing financial reporting and work with auditors. Big firms also have stronger incentives to file and announce financial reports earlier.

The second column of Table 5 provides the results of one-year ahead model regressing audit lags on relative ERM implementation, which are consistent with those of contemporaneous model in the first column. The negative coefficient on $ERMS_{it}$ (-0.205, t-value: -5.21) implies the positive effect of ERM on the efficiency of future audit work. While IC weaknesses (ICW_{it}) is still positively related to audit report lag in the next year, the coefficient magnitude (0.218, t-value: 3.08) becomes smaller than that with regard to current audit report lag. The coefficient on $ERMS_{it}*ICW_{it}$ is significantly positive (0.009, t-value: 2.26) and consistent with the findings with regard to the contemporaneous model.

<Tables 5 is inserted about here>

The Public Company Accounting Oversight Board (PCAOB) introduced AS5 in June 2007 to replace AS2. AS5 requires a top-down risk-based approach in audit work with the goal to reduce burdensome requirements in AS2. Prior research provides supportive evidences in audit fee and audit report lags (Jiang and Wu 2009; Doogar et al. 2010; Krish et al. 2011; Wang and Zhou 2012; Mitra, Song, and Yang 2015, etc.). Doogar et al. (2010) finds that in AS5 period audit fees are generally lower and more related to auditee fraud risk as compared to those in AS2 period, suggesting the improvement of audit efficiency and effectiveness under a risk-based approach. Mitra et al. (2015) also document that audit report lags are lower in the AS5 years relative to the AS2 years. Under the requirements of AS5, auditors are allowed to: (i) rely on works of others,

such as internal auditors, firm personnel, and audit committee, and knowledge retrieved in the past; (ii) employ a top-down approach to evaluate control problems and audit risks, from overall risk regarding IC to entry-level or account-level IC risks; and (iii) to implement a risk-based approach and focus on high-risk area for IC tests. Hence, the information collected via ERM framework, such as firms' internal risk assessment or gap analysis around the capabilities to manage priority risks, may help auditors deploy the risk-based auditing.

Table 6, Panel A, presents the results of audit fees regression models incorporating the indicator for the firm-year subject to AS5 (*AS5*). The estimated coefficients on $ERMS_{it}$ and ICW_{it} are significant and consistent with our main analyses reported in Table 4. The coefficients on AS5 are consistently negative in both contemporaneous and one-year-ahead models, supporting the findings in prior studies (Jian and Wu 2009, Doogar et al. 2010, Krishnan et al. 2011, etc.) that AS5 in general leads to lower audit fees. We further address the incremental effects of ERM in AS5 years. The interaction terms, $AS5_{it}*ERMS_{it}$, are negative and significant at the 0.01 level across all models, supporting our hypothesis H3(a) that in the post-AS5 period, the implementation of ERM is associated with lower audit fees. In model 2 we include the triple interaction term, $AS5_{it}*ERMS_{it}*ICW_{it}$, to further address the relation between IC and ERM after AS5 was adopted. The estimated coefficient is positive but only significant in one-year-ahead model, suggesting that ERM implementation cannot lower future audit fees when material IC weaknesses are presented in the post-AS5 period.

Table 6, Panel B, reports the results of regressing ERM implementation, IC weaknesses, and AS5 indicator on audit report lags. The estimated coefficients on $ERMS_{it}$ and ICW_{it} are consistent with the results in Table 5 and those on $AS5_{it}$ are negative across all models, which are consistent

with the findings in Mitra et al. (2015)[11] and imply the audit process has become more timely in the post-AS5 period. We address the interaction terms and find that the estimated coefficients on $AS5_{it}*ERMS_{it}$, are significantly negative in both current and one-year-ahead audit report lag models, indicating the implementation of ERM can further shorten audit report lags after the risk-based approach for IC audit was required under AS5 and supporting the hypothesis H3(b). When considering the roles of ERM in the environment lack of effective IC, we find that the magnitude of the positive coefficients on ICW_{it} is greater than the negative coefficients on $ERMS_{it}$. The estimated coefficients on the related interaction terms, including $ERMS_{it}*ICW_{it}$, and $AS5_{it}*ERMS_{it}*ICW_{it}$, are both insignificant in most models. Overall, the empirical evidence suggests that ERM cannot reduce audit report lags when material IC weaknesses present.

<Tables 6 is inserted about here>

Table 7 presents the results with regard to the remediation of material IC weaknesses. We follow the model structure in Munsif et al. (2012) and include the indicator, REM_{it}, identifying firm-year remediating material IC problems in the last year and its interaction with relative ERM implementation. The first and second columns are results of current and one-year-ahead audit fee models. The coefficients on REM_{it} are consistently positive. Although they are not significant, the results are still consistent with the findings in Munsif et al. (2011) that the remediating firms tend to pay significant higher audit fees in one and two years subsequent to the remediation. The estimated coefficient on $ERMS_{it}*REM_{it}$ is significantly negative in model 2 (coefficient: -0.062, t-value: -1.72). We also compare firms with material IC weaknesses and those remediating

[11] Mitra et al. (2015) tested all non-accelerated filers (full sample), as well as accelerated filer (with market cap between $75 million and $700 million) and large accelerated fillers (with market cap greater than $700 million) separately and find consistent results. The main concern is that the 10-K filing deadline for large accelerated filers was changed from 75 days to 60 days on or after December 15, 2006 and may therefore lower and bias the findings regarding audit report lags. We also follow it to exclude and separately examine the subsample of large accelerated filers (3,636 observations) and find the consistent (stronger) results.

previous material IC problems. Although the magnitude of the estimated coefficients on $ICW_{it}+ERMS_{it}*ICW_{it}$ is greater than those on $REM_{it}+ERMS_{it}*REM_{it}$, the tests of coefficients equality only report significant difference in the one-year ahead model (coefficient difference: 0.061, F-value: 3.51), To summarize, the results suggest that although the remediating firms still pay higher audit fees than firms never present IC problems, the audit cost is lower than those paid by firms with material IC weaknesses. In addition, ERM can further reduce the future audit fees for remediating firms, which is supportive to our hypothesis H4(a).

The third and fourth columns of Table 7 report the results for current and future audit report lags, which are consistent with the findings in Munsif et al. (2012). Without the effects of ERM, the current and future audit lags are longer for remediating firms (coefficients: 0.027 and 0.059 respectively, t-values: 2.27 and 2.13 respectively) than firms never have IC problems, but such lags are still shorter than firms with material IC weaknesses (coefficients: 0.242 and 0.118 respectively, t-values: 6.45 and 3.08 respectively). The estimated coefficients on $ERMS_{it}*REM_{it}$ are negative but only significant in the one-year-ahead model, suggesting the effects of ERM on reducing future audit report lags for remediating firms and supporting the hypothesis H4(b). The tests of equality between $ICW_{it}+ERMS_{it}*ICW_{it}$ and $REM_{it}+ERMS_{it}*REM_{it}$ are significant in current (F-value: 20.37) and future (F-value: 4.23) audit report lags models, implying that firms remediating their previous IC problems can improve current and future audit efficiency significantly.

<Tables 7 is inserted about here>

Robustness Checks

We employ alternate methods to examine the robustness of our findings. We use different thresholds to exclude outliers. We trim the pooled sample at upper and lower 1 percentile and

winsorize all continuous variables at upper and lower 0.5 percentile. Both methods generate results similar to the main analyses. To address the potential issues multicollinearity problems, we check the variance inflation factors (VIF) of tested variables and find the values are smaller than 2.5 in most cases, suggesting that tested and control variables are not complete substitutes.

The results of univariate tests and descriptive statistics raise the concerns of endogenous problems. For instance, larger firms are more likely to have enough resources to establish better corporate governance, set stronger internal control systems, hire big-N auditors, as well as implementing ERM program. The associations between ERM and audit fees or audit report lags therefore could be driven by factors other than ERM itself. In order to clarify the effects of ERM, we employ a propensity-score-matched (PSM) subsample and rerun our main analyses as robustness tests. The propensity scores are estimated by the existence of material IC weaknesses, firm size, return on assets, leverage, and industry. In the end we have 697 firm-year observations implementing ERM to match with 697 non-ERM adopters. The related results are presented in Table 8 and are consistent with our main findings in Table 4 and 5. The relative implementation of ERM is consistently and negatively associated with audit fees and audit report lags, both in current and one-year-ahead models. However, the presence of material IC weaknesses significantly moderate and offset the effects of ERM, suggesting that IC and ERM should complement each other (COSO 2016b, Chesley et al. 2016). Overall, our main conclusion that ERM implementation is related to better audit efficiency, including lower audit fees and shorter audit report lags, is further verified.

<Tables 8 is inserted about here>

V. CONCLUSION

The study investigates the roles of ERM in external audit by examining whether the implementation of an ERM program can improve audit efficiency, measured by audit fees and audit report lags. ERM encompasses and extends IC to provide a broader focus and form a more robust conceptualization with much greater emphasis on risk evaluated at firm level (COSO 2004; 2016a). The primary objective of ERM is to improve decision-making processes at both strategic and operational levels through a holistic approach of managing enterprise risk. Prior literature in ERM mainly links the implementation or quality of ERM to firm value and performance (Gordon, Loeb, and Tseng, 2009; Hoyt and Liebenberg, 2011; Baxter et al., 2013), financial reporting risk (Cohen et al. 2014), and accounting quality (Gao et al. 2016), suggesting that ERM affects not only operational process but also information quality and cross-functional communication within firm. Given that ERM integrates risk management, IC and corporate governance at the strategic level, it is worth investigating whether external auditors can also benefit from ERM.

Most prior ERM studies are based on survey data, database with limited sample size and year, such as S&P ERM ratings, or small sample from specific industry, such as banking or insurance industries. By using text search techniques and hand collected ERM implementation data from SEC filings, we construct a sample of 4,517 firm-year (466 firms) observations for the period of 2004-2014 across different industries, which enable us to examine long-term effects of ERM and shed light on the literature in ERM, IC, and audit efficiency.

The tests for our first and second research questions provide evidence that ERM implementation is associated with lower audit fees and shorter audit report lags. We explain these findings from the perspective of audit efficiency. First, ERM identifies and aligns operational risks to stabilize firm future performance and decrease inherent risk. Second, ERM extends and

improves IC and the reliability of financial reporting, and therefore decreases the control risk of a firm. Third, ERM emphasizes effective communication among internal and external parties. Given the ERM framework, auditors can rely on the relevant, material information generated through a top-down, risk-based approach to evaluate control effectiveness and focus more on high risk areas related to IC. The analyses for our third research question with regard to AS5 show that firms implementing ERM, on average, pay less audit fees and have few audit report lags in the post-AS5 period. These results are consistent with prior literature documenting lower audit fees (Jiang and Wu 2009) and lower audit report lags (Mitra et al. 2015) after AS5 was introduced. The implementation of ERM hence is in line with the goal of AS5 to reduce burdensome requirements in former standards, namely AS2, and improve audit efficiency. Our fourth research question focuses on the remediation of previous material IC weaknesses. We find that ERM has a negative incremental effect on the relationship between firms remediating their past material IC weaknesses and the firms' future audit fees and audit report lags.

We employ multiple methods to check the robustness of our results. First, we use different thresholds and techniques to mitigate the effects of outliers. After trimming the pooled sample at both upper and lower 1 percentile, as well as winsorizing at upper and lower 0.5 percentile for all continuous variables, the results and conclusions are held. Second, we address multicollinearity problems by checking the VIF of tested variables. In most cases the VIF are smaller than 2.5, suggesting the tested and control variables are not complete substitutes. Third, we construct a matched subsample through PSM techniques to control for the endogeneity problems. The univariate tests for the pooled sample show that firms implementing ERM are more likely to have better IC, pay higher audit fees, and have shorter audit report lags. We match 697 firm-year implementing ERM with 697 firm-year without ERM by firm characters, including firm size,

financial conditions, performance, IC effectiveness, and industry to rerun the tests and confirm our main findings.

Taken together, our study indicates the ERM program can benefit both firms and external auditors. The implementation of ERM not only improves the effectiveness of IC, but also increases audit efficiency by lowering audit fees and reducing audit report lags. Auditors also can rely on the information provided by ERM to conduct the top-down risk-based audit in light of the AS5 requirements and decrease related workloads. The empirical evidence shed light on the benefits of ERM implementation and should provide regulators and firm policy makers insights for planning and developing the requirements and implementation of ERM framework.

While this study provides important insights into the benefit of ERM to external audit work, there could be certain caveats. First, we can only make an indirect observation on the relationship between ERM and audit behavior. Audit fees and audit report lags may not be the perfect proxies for audit efficiency. We cannot identify which information provided by ERM framework is used by auditors or how an ERM framework changes the auditing process specifically. Second, although we apply multiple thresholds and rely on various sources to determine relative ERM implementation, we cannot measure its quality. Prior studies use survey data, S&P risk management database, or other data sources to measure ERM quality, but most of them draws their conclusions based on limited sample covering few years or specific industries, such as banking or insurance industries. We acknowledge these limitations and construct a long-term panel data across multiple industries accordingly to provide the most generalized results.

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Table 1
Sample Selections

	Firms	Firm-years
Firm observations between 2004 and 2014 in *Compustat North America*	18,822	136,564
Less: Observations in financial industry	(6,048)	(52,083)
Missing values in CIK number	(1,901)	(14,523)
Missing consecutive data between 2004 and 2014	(7,462)	(36,301)
Missing market value data in *CRSP*	(559)	(6,032)
Subtotal	2,852	27,625
Less: Missing audit fee data in *Audit Analytics*	(1,306)	(13,470)
Non-accelerated filers in *Audit Analytics*[12]	(908)	(8,607)
Subtotal firms available between 2004 and 2014	638	5,548
Less: Missing firm data in SEC filing and tested variables	(172)	(1,031)
Final sample firm observations	466	4,517

[12] Non-accelerated filers are defined as firms with market capitalization less than $75 million per U.S. Securities and Exchange Commission's (SEC) definition. See https://www.sec.gov/answers/form10k.htm.

Table 2
Sample Composition[13]

Panel A: Industry Composition

Industry	SIC	Obs.	(Firm)	ERM_{it}=1	ERM_{it}=0	Implementation Rate
Chemical & Allied Products	28	431	(44)	91	340	21.11%
Machinery	35	394	(39)	106	288	26.90%
Electronic Equipment	36	380	(37)	135	245	35.53%
Electric, Gas, & Sanitary	49	379	(41)	96	283	25.33%
Instruments	38	346	(33)	99	247	28.61%
Oil & Gas Extraction	13	260	(27)	73	187	28.08%
Business Services	73	220	(28)	73	147	33.18%
Food	20	154	(15)	32	122	20.78%
Transportation Equipment	37	148	(15)	52	96	35.14%
Wholesale Trade	50	141	(14)	32	109	22.70%
Others		1,664	(173)	498	1,166	29.93%
Total		4,517	(466)	1,287	3,230	28.49%

Panel B: Year Composition[14]

Year	Obs.	ERM_{it} =1	ERM_{it} =0	Implementation Rate
2004	417	95	322	22.78%
2005	416	98	318	23.56%
2006	412	99	313	24.03%
2007	414	105	309	25.36%
2008	411	109	302	26.52%
2009	412	115	297	27.91%
2010	409	125	284	30.56%
2011	405	129	276	31.85%
2012	406	132	274	32.51%
2013	406	135	271	33.25%
2014	409	145	264	35.45%
	4,517	1,287	3,230	28.49%

[13] ERM_{it} is an indicator to identify whether the enterprise risk management is employed or not. ERM equals one if the firm-year implements ERM, and zero otherwise

[14] We keep observations as many as possible in the main analyses to obtain most generalized results. We also consider using the balanced sample to have 395 observations in each year. The implementation rate in this case ranges from 20.25% in 2004 to 35.70% in 2014 and the main findings are held.

Table 3
Descriptive Statistics

Panel A: Variable Distributions

	Pooled Sample (n=4,517)				ERM_{it}=1 (n=1,287)		ERM_{it}=0 (n=3,230)		
Variable	Mean	S.D.	Min	Max	Mean	S.D.	Mean	S.D.	Difference
$AFEE_{it}$	9.768	0.957	4.520	11.454	9.722	0.922	9.786	0.884	-0.064 ***
$AULAG_{it}$	3.997	0.208	2.773	6.713	3.856	0.177	4.053	0.899	-0.197 ***
ERM_{it}	0.285	0.452	0.000	1.000	1.000	0.000	0.000	0.000	1.000 ***
$ERMS_{it}$	0.370	0.619	0.000	3.000	1.297	0.677	0.000	0.000	1.297 ***
ICW_{it}	0.020	0.139	0.000	1.000	0.002	0.121	0.027	0.177	-0.025 ***
$SIZE_{it}$	8.697	1.339	4.553	13.590	10.632	1.280	7.926	1.160	2.706 ***
ROA_{it}	0.152	0.089	-0.869	0.623	0.117	0.084	0.166	0.100	-0.049 ***
MTB_{it}	2.010	8.169	0.021	409.892	2.058	8.967	1.991	5.705	0.067
$SQRTSEG_{it}$	1.802	0.720	1.000	5.568	2.028	0.733	1.712	0.681	0.316 ***
LEV_{it}	0.245	0.179	0.000	2.057	0.245	0.167	0.245	0.205	0.000
GC_{it}	0.003	0.050	0.000	1.000	0.000	0.037	0.005	0.074	-0.004 ***
$DACC_{it}$	0.047	0.068	0.000	0.745	0.032	0.065	0.053	0.073	-0.021 ***
SPI_{it}	0.783	0.412	0.000	1.000	0.908	0.398	0.733	0.443	0.175 ***
$RESTATE_{it}$	0.099	0.298	0.000	1.000	0.021	0.280	0.130	0.336	-0.109 ***
CGI_{it}	0.729	0.147	0.000	1.000	0.780	0.139	0.708	0.174	0.072 **
$BIG4_{it}$	0.791	0.092	0.000	1.000	0.804	0.082	0.786	0.113	0.018 *
$CHANGE_{it}$	0.025	0.157	0.000	1.000	0.002	0.139	0.034	0.193	-0.032 ***
$AS5_{it}$	0.724	0.442	0.000	1.000	0.395	0.477	0.855	0.317	-0.460 ***
REM_{it}	0.016	0.108	0.000	1.000	0.009	0.093	0.019	0.137	-0.010 ***

All variables are defined in Appendix. ***, **, and * indicate two-sided statistical significance at the 1, 5 and 10% levels respectively.

Panel B: Pearson Correlation Matrix

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
$AFEE_{it}$	1	**1.00**																		
$AULAG_{it}$	2	**0.20**	**1.00**																	
ERM_{it}	3	**-0.05**	**-0.10**	**1.00**																
$ERMS_{it}$	4	**-0.10**	**-0.12**	**0.59**	**1.00**															
ICW_{it}	5	**0.09**	**0.16**	*-0.03*	*-0.03*	**1.00**														
$SIZE_{it}$	6	**0.46**	**-0.22**	**0.12**	**0.17**	**-0.07**	**1.00**													
ROA_{it}	7	*0.04*	0.01	**0.13**	**0.06**	**-0.05**	**0.16**	**1.00**												
MTB_{it}	8	-0.01	**-0.07**	-0.01	-0.01	-0.01	**0.09**	**0.03**	**1.00**											
$SQRTSEG_{it}$	9	**0.21**	*0.04*	**0.08**	**0.07**	0.03	**0.11**	*0.08*	*0.04*	**1.00**										
LEV_{it}	10	**0.08**	**0.11**	0.02	*0.03*	0.02	**-0.07**	**-0.06**	**-0.17**	**-0.17**	**1.00**									
GC_{it}	11	0.03	0.02	-0.01	-0.01	0.04	*-0.03*	-0.02	-0.01	0.01	-0.01	**1.00**								
$DACC_{it}$	12	**0.09**	-0.01	*-0.03*	*-0.04*	*0.03*	*-0.04*	0.01	**0.16**	**0.08**	**-0.17**	-0.01	**1.00**							
SPI_{it}	13	**0.12**	-0.01	**-0.07**	**-0.08**	*0.04*	-0.01	**-0.11**	**-0.07**	**0.14**	**0.11**	0.02	-0.01	**1.00**						
$RESTATE_{it}$	14	0.01	**0.07**	**-0.06**	**-0.06**	0.02	**-0.05**	0.09	*-0.04*	-0.01	*0.04*	-0.01	*-0.03*	0.00	**1.00**					
CGI_{it}	15	**-0.14**	**-0.09**	**0.16**	**0.14**	-0.03	**0.03**	-0.02	**-0.06**	**0.07**	**-0.05**	*0.04*	**-0.07**	**-0.07**	-0.02	**1.00**				
$BIG4_{it}$	16	**0.08**	-0.01	0.02	*0.04*	-0.01	**0.02**	-0.02	-0.01	*0.03*	*0.04*	0.00	-0.02	*0.04*	0.01	**0.07**	**1.00**			
$CHANGE_{it}$	17	0.02	**0.06**	**-0.05**	-0.04	**0.05**	0.05	-0.02	**0.06**	0.01	0.00	-0.01	0.01	-0.01	**0.04**	-0.02	*-0.03*	**1.00**		
$AS5_{it}$	18	**-0.05**	**-0.19**	**0.52**	**0.32**	*-0.03*	-0.01	**-0.13**	*0.04*	*0.03*	*0.03*	0.02	0.01	*0.03*	**-0.08**	0.01	-0.02	**-0.07**	**1.00**	
REM_{it}	19	**0.06**	*0.03*	-0.02	*-0.03*	-0.01	**-0.05**	-0.01	-0.01	0.01	0.01	-0.01	-0.00	0.02	-0.01	-0.02	0.01	**0.07**	*-0.03*	**1.00**

Numbers reported in **bold** and *italics* represent strong ($p<0.01$) or weak ($p<0.05$ or $p<0.1$) levels of significance respectively.

Table 4
Regressions of Audit Fees on Enterprise Risk Management

Variables	Expected Sign	Dependent Variable: $AFEE_{it}$	Dependent Variable: $AFEE_{it+1}$
$ERMS_{it}$	-	-0.265***	-0.310**
		(-2.61)	(-2.07)
ICW_{it}	+	0.801***	1.296**
		(2.83)	(3.15)
$ERMS_{it}*ICW_{it}$	+/-	0.016*	0.270
		(1.68)	(1.27)
$SIZE_{it}$	+	2.369***	2.404***
		(5.34)	(5.35)
ROA_{it}	+/-	0.782***	1.034***
		(3.39)	(4.31)
MTB_{it}	+/-	1.022*	1.670***
		(1.91)	(2.79)
$SQRTSEG_{it}$	+	0.873***	0.597***
		(7.28)	(4.66)
LEV_{it}	+	2.448***	2.511***
		(5.12)	(4.98)
GC_{it}	+	0.998***	1.419*
		(3.39)	(1.65)
$DACC_{it}$	+/-	0.432***	0.940**
		(3.05)	(2.21)
SPI_{it}	+	1.503***	1.547***
		(4.88)	(7.66)
$RESTATE_{it}$	+	-0.364	-0.122
		(-1.35)	(-0.49)
CGI_{it}	+/-	-0.033**	-0.068***
		(-2.06)	(-3.01)
$BIG4_{it}$	+	0.399***	0.318***
		(4.01)	(3.18)
$CHANGE_{it}$	+/-	0.081	0.198
		(0.16)	(0.40)
Fixed Effects		Industry Year	Industry Year
Obs.		4,517	4,084
F value		125.12	130.07
Adjusted R^2		0.716	0.752

All variables are defined in Appendix A. ***, **, and * indicate two-sided statistical significance at the 1, 5 and 10% levels respectively. Robust t-statistics based on standard errors clustered at firm level and fiscal year are reported in parentheses.

Table 5
Regressions of Audit Report Lags on Enterprise Risk Management

Variables	Expected Sign	Dependent Variable: $AULAG_{it}$	Dependent Variable: $AULAG_{it+1}$
$ERMS_{it}$	-	-0.187***	-0.205***
		(-4.88)	(-5.21)
ICW_{it}	+	0.241***	0.218***
		(6.44)	(3.08)
$ERMS_{it}*ICW_{it}$	+/-	0.037**	0.009**
		(2.13)	(2.26)
$SIZE_{it}$	-	-0.020***	-0.027***
		(-6.96)	(-9.51)
ROA_{it}	+/-	0.024	0.053
		(0.67)	(1.42)
$SQRTSEG_{it}$	+	0.009**	0.007*
		(2.26)	(1.68)
LEV_{it}	+	0.122***	0.116***
		(6.78)	(6.34)
GC_{it}	-	0.116	0.051
		(1.27)	(1.59)
$DACC_{it}$	+	0.139*	0.146**
		(1.74)	(2.19)
SPI_{it}	+	-0.011	0.005
		(-1.49)	(0.70)
$RESTATE_{it}$	+	0.038***	0.020**
		(3.72)	(2.03)
CGI_{it}	+/-	-0.013*	-0.008***
		(-1.84)	(-2.36)
$CHANGE_{it}$	+	0.057***	0.038**
		(3.05)	(2.00)
$AFEE_{it}$	+	0.004***	0.002**
		(7.69)	(3.43)
Fixed Effects		Industry Year	Industry Year
Obs.		4,517	4,054
F value		54.76	55.99
Adjusted R^2		0.271	0.292

All variables are defined in Appendix A. ***, **, and * indicate two-sided statistical significance at the 1, 5 and 10% levels respectively. Robust t-statistics based on standard errors clustered at firm level and fiscal year are reported in parentheses.

Table 6
Regressions of Audit Fees and Audit Report Lags on ERM: The Effect of AS5

Panel A: Audit fees model with additional control (AS5) and interactions

	Expected	Dependent Variable: $AFEE_{it}$		Dependent Variable: $AFEE_{it+1}$	
Variables	Sign	Model 1	Model 2	Model 1	Model 2
$ERMS_{it}$	-	-0.298***	-0.296***	-0.262**	-0.260**
		(-2.67)	(-2.65)	(-2.31)	(-2.29)
ICW_{it}	+	2.490**	2.131*	0.405***	0.525***
		(2.53)	(1.88)	(2.41)	(2.49)
$ERMS_{it}*ICW_{it}$	+/-	0.007**	0.023	0.099***	0.025**
		(2.01)	(1.22)	(3.18)	(1.98)
$AS5_{it}$	-	-1.857***	-1.881***	-2.254***	-2.344***
		(-4.74)	(-4.77)	(-5.73)	(-5.91)
$AS5_{it}*ERMS_{it}$	-	-1.341***	-1.350***	-2.159***	-2.212***
		(-3.48)	(-3.49)	(-5.46)	(-5.56)
$AS5_{it}*ICW_{it}$	+		1.574		1.752*
			(1.44)		(1.74)
$AS5_{it}*ERMS_{it}*ICW_{it}$	+		0.757		1.364**
			(1.20)		(2.03)
Control Variables		Included	Included	Included	Included
Fixed Effect: Industry and Year		Included	Included	Included	Included
Obs.		4,517	4,517	4,084	4,084
F value		116.98	104.65	121.61	109.12
Adjusted R^2		0.723	0.732	0.737	0.737

Panel B: Audit report lags model with additional control (AS5) and interactions

	Expected	Dependent Variable: $AULAG_{it}$		Dependent Variable: $AULAG_{it+1}$	
Variables	Sign	Model 1	Model 2	Model 1	Model 2
$ERMS_{it}$	-	-0.117***	-0.124***	-0.156***	-0.158***
		(-2.77)	(-2.95)	(-3.60)	(-3.64)
ICW_{it}	+	0.203***	0.283***	0.198***	0.114***
		(5.46)	(6.62)	(2.59)	(2.72)
$ERMS_{it}*ICW_{it}$	+/-	0.019	0.077*	0.005	0.026
		(1.60)	(1.91)	(1.14)	(1.56)
$AS5_{it}$	-	-0.126***	-0.123***	-0.102***	-0.101***
		(-8.50)	(-8.27)	(-6.70)	(-6.60)
$AS5_{it}*ERMS_{it}$	-	-0.050***	-0.052***	-0.049***	-0.049***
		(-3.43)	(-3.52)	(-3.22)	(-3.23)
$AS5_{it}*ICW_{it}$	+		0.112*		0.127*
			(1.83)		(1.71)
$AS5_{it}*ERMS_{it}*ICW_{it}$	+		0.042		0.043
			(1.02)		(1.32)
Control Variables		Included	Included	Included	Included
Fixed Effects: Industry and Year		Included	Included	Included	Included
Obs.		4,517	4,517	4,054	4,054
F value		56.66	53.75	53.88	51.29
Adjusted R^2		0.221	0.224	0.293	0.292

All variables are defined in Appendix A. ***, **, and * indicate two-sided statistical significance at the 1, 5 and 10% levels respectively. Robust t-statistics based on firm-year clustered standard errors are reported in parentheses.

Table 7
Regressions of Audit Fees and Audit Lags on Remediation of IC Weakness

Variables	Exp. Sign	*Audit Fees Model*		*Audit Lags Model*	
		$AFEE_{it}$	$AFEE_{it+1}$	$AULAG_{it}$	$AULAG_{it+1}$
$ERMS_{it}$	-	-0.270***	-0.208**	-0.187***	-0.207***
		(-2.66)	(-2.04)	(-4.87)	(-5.27)
ICW_{it}	+	0.283***	0.292**	0.242***	0.118***
		(2.86)	(2.29)	(6.45)	(3.08)
$ERMS_{it}*ICW_{it}$	+/-	0.406	0.098**	0.037	-0.008**
		(0.47)	(2.15)	(1.13)	(-2.24)
REM_{it}	+/-	0.521	0.391	0.027**	0.059**
		(0.36)	(1.29)	(2.27)	(2.13)
$ERMS_{it}*REM_{it}$	-	-0.232	-0.062*	-0.016	-0.013*
		(-1.42)	(-1.72)	(-1.25)	(-1.66)
Control Variables		Included	Included	Included	Included
Fixed Effects		Industry Year	Industry Year	Industry Year	Industry Year
Obs.		4,517	4,084	4,517	4,054
F value		117.92	122.17	52.18	52.94
Adjusted R^2		0.717	0.763	0.271	0.292
Coefficient Difference: ($ICW_{it}+ERMS_{it}*ICW_{it}$)-($REM_{it}+ERMS_{it}*REM_{it}$)		0.400	0.061	0.268	0.064
Test of Equality: (F value) ($ICW_{it}+ERMS_{it}*ICW_{it}$)=($REM_{it}+ERMS_{it}*REM_{it}$)		0.75	3.51**	20.37***	4.23**

All variables are defined in Appendix A. ***, **, and * indicate two-sided statistical significance at the 1, 5 and 10% levels respectively. Robust t-statistics based on standard errors clustered at firm level and fiscal year are reported in parentheses. The audit fees model and audit lags model are respectively revised to incorporate REM_{it}, the indicator identifying the remediation of material internal control weakness in last year, and the related interaction term as below.

Audit fees model:

$$AFEE_{it} \text{ or } AFEE_{it+1} = \alpha_0+\alpha_1 ERMS_{it}+\alpha_2 ICW_{it}+\alpha_3 ERMS_{it}*ICW_{it}+\alpha_4 REM_{it}+\alpha_5 ERMS_{it}*REM_{it}+\alpha_6 SIZE_{it} +\alpha_7 ROA_{it}+\alpha_8 MTB_{it}+\alpha_9 SQRTSEG_{it}+\alpha_{10} LEV_{it}+\alpha_{11} GC_{it}+\alpha_{12} DACC_{it}+\alpha_{13} SPI_{it} +\alpha_{14} RESTATE_{it}+\alpha_{15} CGI_{it}+\alpha_{16} BIG4_{it}+\alpha_{17} CHANGE_{it}+\varepsilon_{it}$$

Audit lag model:

$$AULAG_{it} \text{ or } AULAG_{it+1} = \beta_0+\beta_1 ERMS_{it}+\beta_2 ICW_{it}+\beta_3 ERMS_{it}*ICW_{it}+\beta_4 REM_{it}+\beta_5 ERMS_{it}*REM_{it} +\beta_6 SIZE_{it} +\beta_7 ROA_{it}+\beta_8 SQRTSEG_{it}+\beta_9 LEV_{it}+\beta_{10} GC_{it}+\beta_{11} DACC_{it}+\beta_{12} SPI_{it} +\beta_{13} RESTATE_{it} +\beta_{14} CGI_{it}+\beta_{15} CHANGE_{it}+\beta_{16} AFEE_{it}+\gamma_{it}$$

Table 8
Regressions of Audit Fees and Audit Report Lags on ERM:
Propensity-Score-Matched (PSM) Sample

Variables	Exp. Sign	*Audit Fees Model*		*Audit Lags Model*	
		$AFEE_{it}$	$AFEE_{it+1}$	$AULAG_{it}$	$AULAG_{it+1}$
$ERMS_{it}$	-	-0.370**	-0.802**	-0.215**	-0.232**
		(-1.95)	(-2.02)	(-2.15)	(-2.23)
ICW_{it}	+	0.570***	1.137**	0.273***	0.174***
		(3.50)	(2.25)	(6.44)	(2.58)
$ERMS_{it}*ICW_{it}$	+/-	0.143***	0.259**	0.185	0.179***
		(2.61)	(2.11)	(1.27)	(4.31)
Control Variables		Included	Included	Included	Included
Fixed Effects		Industry Year	Industry Year	Industry Year	Industry Year
Obs		1,394	1,394	1,394	1,394
F value		94.79	107.92	50.89	52.46
Adjusted R^2		0.772	0.796	0.241	0.248

All variables are defined in Appendix A. ***, **, and * indicate two-sided statistical significance at the 1, 5 and 10% levels respectively. Robust t-statistics based on standard errors clustered at firm level and fiscal year are reported in parentheses. The subsample consists of 697 ERM adopters (firm-year) matched by the propensity scores of 697 non-ERM adopters (firm-year) estimated by material IC weakness, firm size, return on assets, market capitalization, leverage, financial condition, and two-digit SIC code. The audit fees model and audit lags model are respectively listed below.

Audit fees model:

$$AFEE_{it} \text{ or } AFEE_{it+1} = \alpha_0+\alpha_1 ERMS_{it}+\alpha_2 ICW_{it}+\alpha_3 ERMS_{it}*ICW_{it}+\alpha_4 SIZE_{it}+\alpha_5 ROA_{it}+\alpha_6 MTB_{it} +\alpha_7 SQRTSEG_{it}+\alpha_8 LEV_{it}+\alpha_9 GC_{it}+\alpha_{10} DACC_{it}+\alpha_{11} SPI_{it} +\alpha_{12} RESTATE_{it} +\alpha_{13} CGI_{it}+\alpha_{14} BIG4_{it}+\alpha_{15} CHANGE_{it}+\varepsilon_{it}$$

Audit lag model:

$$AULAG_{it} \text{ or } AULAG_{it+1} = \beta_0+\beta_1 ERMS_{it}+\beta_2 ICW_{it}+\beta_3 ERMS_{it}*ICW_{it}+\beta_4 SIZE_{it}+\beta_5 ROA_{it}+\beta_6 SQRTSEG_{it} +\beta_7 LEV_{it}+\beta_8 GC_{it}+\beta_9 DACC_{it}+\beta_{10} SPI_{it} +\beta_{11} RESTATE_{it}+\beta_{12} CGI_{it}+\beta_{13} CHANGE_{it} +\beta_{14} AFEE_{it}+\gamma_{it}$$

Appendix A
Variable Definition

Variables	Definitions
$AFEE_{it}$	= Natural logarithm of audit fees in thousands.
$AULAG_{it}$	= Natural logarithm of the number of calendar days from fiscal year-end date to auditor's report date.
ERM_{it}	= An indicator equal to one if the firm-year implements enterprise risk management, and zero otherwise.
$ERMS_{it}$	A firm-year's relative degree of implementing enterprise risk management (score 0-3) based on three conditions, including: (i) employing a holistic process and framework for risk management; (ii) specifically setting up a chief risk officer (CRO) in the senior management team; (iii) the board of directors includes an independent risk committee to oversee a firm's risk management policies. Each condition is assigned one point respectively.
ICW_{it}	= An indicator equal to one if the firm-year has an internal control weakness, and zero otherwise.
$SIZE_{it}$	= Natural logarithm of total assets at the beginning of year *t*.
ROA_{it}	= Return on total assets, which equals income before extraordinary items divided by total assets at the beginning of year *t*.
MTB_{it}	= Market-to-book ratio.
$SQRTSEG_{it}$	= Square root of the number of business segments.
LEV_{it}	= Leverage, which is equal to long-term debt divided by total assets at the beginning of year *t*.
GC_{it}	= An indicator equal to one for firms with going concern modified opinion and zero otherwise.
$DACC_{it}$	= Absolute value of performance-adjusted abnormal accruals based on Kothari et al. (2005).
SPI_{it}	= An indicator equal to one if firm reports special items and zero otherwise.
$RESTATE_{it}$	= An indicator equal to one if firm discloses a restatement and zero otherwise.
CGI_{it}	Corporate governance index (percentile) from *Datastream* database.
$BIG4_{it}$	= An indicator equal to one for big four accounting firm and zero otherwise.
$CHANGE_{it}$	= An indicator equal to one if there is a change in auditor and zero otherwise.
$AS5_{it}$	= An indicator equal to one for firm-years that were subject to the internal control audits under Audit Standard No. 5 (AS5) in year *t*, and zero otherwise.
REM_{it}	= An indicator equal to one for firm-years that that remediates material IC weakness in year *t-1*, and zero otherwise.

Note: The subscript *i* denotes the firm and the subscript *t* refers to the fiscal year.

Appendix B
Examples of Enterprise Risk Management (ERM)

B1. PITNEY BOWES INC. (CIK: 0000078814, Filing date: 2010/02/26, Form: 10-K, p. 5)

ITEM 1A. – RISK FACTORS

"In addition to other information and risk disclosures contained in this Form 10-K, the risk factors discussed in this section should be considered in evaluating our business. We work to manage and mitigate these risks proactively, including through our use of an **enterprise risk management program**. In our management of these risks, we also evaluate the potential for additional opportunities to mitigate these risks."

B2. UNITED STATES STEEL CORP (CIK: 0001163302, Form: 10-K, 2013/02/15, p. 53-54)

Item 4. MINE SAFETY DISCLOSURE

The information concerning mine safety violations and other regulatory matters required by Section 150 of the Dodd-Frank Wall Street Reform and Consumer Protection Act ("the Act") and Item 104 of Regulation S-K is included in Exhibit 95 to this Form 10-K.

EXECUTIVE OFFICERS OF THE REGISTRANT

The executive officers of U. S. Steel and their ages as of February 1, 2013, are as follows:

Name	Age	Title	Executive Officer Since
George F. Babcoke	56	Senior Vice President – Europe & Global Operations Services	March 1, 2008
Larry T. Brockway	53	Senior Vice President & **Chief Risk Officer**	August 1, 2011
James D. Garraux	60	General Counsel & Senior Vice President – Corporate Affairs	February 1, 2007

B3. INTL FCStone Inc. (CIK: 0000913760, Form: 10-K, 2012/12/12, p. 12)

Business Risks

The Company seeks to mitigate the market and credit risks arising from its financial trading activities through an active risk management program. The principal objective of this program is to limit trading risk to an acceptable level while maximizing the return generated on the risk assumed.
The Company has a defined risk policy which is administered by the Company's **risk committee**, which reports to the Company's audit committee. The Company has established specific exposure limits for inventory positions in every business, as well as specific issuer limits and counterparty limits. These limits are designed to ensure that in a situation of unexpectedly large or rapid movements or disruptions in one or more markets, systemic financial distress, the failure of a counterparty or the default of an issuer, the potential estimated loss will remain within acceptable levels. The audit committee reviews the performance of the risk committee on a quarterly basis to monitor compliance with the established risk policy.