ABSTRACT

Title of Dissertation: DETERMINING THE IMPACT OF MULTIPLE CONSECUTIVE YEARS OF FINANCIAL REPORTING QUALITY ISSUES ON INVESTMENT EFFICIENCY

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Prior research recognizes that there is a positive relation between financial reporting quality and investment efficiency. The primary object of this dissertation is to examine how financial reporting quality in multiple consecutive years impacts investment efficiency. I use material weaknesses in internal control (MW) as a proxy for poor financial reporting quality and I examine the impact of poor financial reporting quality in multiple consecutive years using an OLS regression model. The results indicate there is a progressively negative impact on investment efficiency tied to the number of consecutive years in which firms report MW. Additionally, I examine whether investment specific financial reporting quality issues have a greater impact on investment efficiency than all other types of financial reporting quality issues. My results suggest that investment specific financial reporting quality issues are driving the negative impact on investment efficiency. These results imply that managers can reduce investment inefficiency by focusing their resources on remediating (correcting) financial reporting quality issues (MW) associated with investment.

Current internal control research identifies firms as having either strong or weak internal control dependent upon (1) the presence or absence of MW or (2) the number of MW. This research essentially treats each MW as being of equal importance, Thus, as a secondary objective of this dissertation, in Appendix B, I develop a metric for internal control using the Analytic Hierarchy Process (AHP) to provide a weighting scheme for the different types of MW. Based on Audit Analytics (which separates MW into 21 different categories), I engage 18 participants in an AHP exercise to determine which types of MW have the greatest impact on the financial statements. The results indicate that auditors and managers find MW related to Personnel Weaknesses have the greatest impact on the financial statements. AHP results in weights that are then applied to the 21 different categories of MW. These weights are applied to firms based upon the types of MW reported and the sum of the weights is the measure used for the internal control metric. I then perform a simple OLS regression to test the relation between the internal control metric and stock market returns (Appendix C). I find that a positive relation exists between strong internal controls (as measured by the newly constructed metric) and stock market returns.

# DETERMINING THE IMPACT OF MULTIPLE CONSECUTIVE YEARS OF FINANCIAL REPORTING QUALITY ISSUES ON INVESTMENT EFFICIENCY

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## Dedication

Dedicated to my parents, Leonard and Lori Wilford

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# Chapter 1 Introduction

## 1.1 Motivation

With the passage of the Sarbanes-Oxley Act (SOX) in 2002, a renewed interest in internal control has been signaled through an influx of academic research focused on internal control. This influx in research has been spurred by the SOX requirement that firms report on the status of their internal control systems within both their quarterly (Section 302) and their annual (Section 404) reports. If a firm finds any material weaknesses in internal control over financial reporting (hereafter, MW), the firm must specifically report those MW within their quarterly and annual reports. This new firm specific internal control information has been used to examine a variety of issues that range from investigating the types of characteristics that are associated with firms that report MW (Ge and McVay 2005; Ashbaugh-Skaife et al. 2007; Doyle et al. 2007a) to investigating the relation between internal control systems and firm performance (Ashbaugh-Skaife et al. 2009; Gordon and Wilford 2012). This information is also helping to lead the way for a stream of research that examines the relation between financial reporting quality and a variety of management, stockholder, and creditor decisions.

Research that uses the information provided as a result of SOX is paving the way for future advances in understanding and improving internal control systems. Although the SOX legislation uses a restricted definition of internal control, internal control over financial reporting, information available through SOX is providing researchers with the opportunity to more comprehensively examine firm-specific internal control issues. The

information gained from this limited view of internal control may one day be used to examine internal control in a more comprehensive format.

One recent research trend in internal control examines the link between financial reporting quality (hereafter, FRQ) and investment efficiency. Lambert et al. (2007) present, theoretically, the effects of accounting information quality upon real investment decisions and Biddle et al. (2009) further examine this issue empirically using accounting information quality metrics. They find that higher FRQ leads to an increase in investment efficiency. Borrowing from the empirical techniques employed by Biddle et al. (2009), Cheng et al. (2011) examine the relation between MW, as a proxy for FRQ, and investment inefficiency and find that there is a negative and significant relation between investment inefficiency and reported MW.

The primary objective of this dissertation is to re-examine and substantially extend the FRQ (as proxied by MW)-investment efficiency relation. I use MW as a proxy for FRQ, following prior research (Cheng et al. 2011; Costello and Wittenberg-Moerman 2011). Additionally, I use the consecutive year MW framework established by Gordon and Wilford (2012) to analyze this relation and the results indicate that firms that consecutively report MW have a progressively negative and significant impact to their investment efficiency. Furthermore, I find that the negative impact on investment efficiency is perpetuated as firms report MW, but this negative impact can be alleviated through remediation. Also, I extend this prior research by examining how the MW-investment efficiency relation is affected by capital investment-specific MW compared to MW in general. The results indicate that capital investment-specific MW drive investment inefficiency.

Current empirical internal control research describes the strength of firms internal control systems either dichotomously, as either strong or weak dependent upon whether the firm reports any internal control weaknesses or dependent on the number of MW reported (Doyle et al. 2007a; Ashbaugh-Skaife et al. 2009; Gordon and Wilford 2012). As secondary objective of this dissertation, I develop an alternative continuous metric of internal control strength using an Analytic Hierarchy Process (AHP) analysis, within Appendix B. This continuous internal control metric is developed using the opinions of three different financial statement stakeholder groups, (1) auditors, (2) financial analysts, and (3) managers. To develop the metric, participants are asked to compare the different types of reported MW using pairwise comparisons. Additionally, I test this metric empirically (Appendix C) to examine whether the metric is significantly related to firm performance. The results from this preliminary examination are significantly positive. For purposes of this dissertation, the AHP analysis, including the strengths and weaknesses of this analysis, are confined to Appendices B and C.

**1.2 Dissertation Outline**

The primary objective of this dissertation is discussed in Chapters 2, 3, 4, and 5. Chapter 2, entitled "Background and Literature Review of Internal Control," examines the historical context of internal control and provides an overview of the SOX-related internal control literature. Only research that is particularly related to SOX and internal control is reviewed. Chapter 3, entitled, "Investment Efficiency and Financial Reporting Quality: Introduction," includes the introduction and the literature review for the dissertation's primary objective. Chapter 4, entitled, "Investment Efficiency and Financial Reporting Quality: Research Design," includes the hypothesis development and

methodology development for the dissertation's primary objective. Chapter 5, entitled, "Investment Efficiency and Financial Reporting Quality: Empirical Results," includes the analyses and conclusions for this dissertation's primary objective, the relation between FRQ and investment efficiency. Chapter 6 provides a brief summary of this dissertation's findings and conclusions.

The secondary objective of the dissertation is discussed in Appendix B, entitled "AHP Applied to Internal Control." I develop a metric of internal control strength based on the types of MW that are reported by firms. I test this metric in Appendix C, entitled "AHP Internal Control Metric and Firm Performance."

# Chapter 2 Background and Literature Review of Internal Control

## 2.1 Introduction

Internal control plays a significant role on the operation of the firm and this role has been recognized by the attention this system has received from regulators, auditors and practitioners. In this chapter, I seek to provide a brief overview of the history of internal control domestically and internationally. Also, since SOX has been the instigator of a new wave of internal control research, I provide a non-comprehensive overview of the accounting research that has resulted in the post-SOX environment.

## 2.2 History of Internal Control Requirements in the U.S.

The definition of internal control has evolved significantly over the past century. Starting with a special report issued by the American Institute of Certified Public Accountants (AICPA), entitled *Internal Control*, in 1949, a special committee defined internal control as:

> *". . . the plan of enterprise and all of the coordinate methods and measures adopted with a business to safeguard its assets, check the accuracy and reliability of its accounting data, promote operational efficiency, and encourage adherence to prescribed managerial policies."* (AICPA 1949, 6)

This definition caused confusion among auditors during the 1960s due to the auditing requirement that:

> *"There is to be proper study and evaluation of the existing internal control as a basis for reliance thereon and for the determination of the resultant extent of tests to which auditing procedures are to be restricted."* (AICPA 1963, 27)

With the evaluation of this internal controls requirement in mind, auditors felt that to adequately test all controls related to operational efficiency and managerial policies would fall outside their expertise. As such, in 1963 the AICPA released Statement on

Auditing Procedure (SAP) No. 33 to provide further clarification to their definition of internal control and the duties of the auditor by distinguishing between two types of control: accounting control and administrative control.

> *"In the broad sense, internal control includes, therefore, controls which may be characterized as either accounting or administrative, as follows:*
>
> *a. Accounting controls comprise the plan of organization and all methods and procedures that are concerned mainly with, and relate directly to, safeguarding of assets and the reliability of the financial records. They generally include such controls as the systems of authorization and approval, separation of duties concerned with record keeping and accounting reports from those concerned with operations or asset custody, physical controls over assets, and internal auditing.*
>
> *b. Administrative controls comprise the plan of organization and all methods and procedures that are concerned mainly with operational efficiency and adherence to managerial policies and usually relate only indirectly to the financial records. They generally include such controls as statistical analyses, time and motion studies, performance reports, employee training programs, and quality controls."* (AICPA 1963, 28)

After creating a clear division between these two types of controls, the SAP explained that the auditor should be primarily concerned with accounting controls, since the auditor's goal is to attest to the reliability of financial data. Although distinguishing between accounting and administrative controls was meant to provide clarification, many accountants believed it provided more confusion (Bower and Schlosser 1965).

In 1977 in connection with the Foreign and Corrupt Practices Act (FCPA), the Securities and Exchange Commission (SEC) enacted additional requirements that firms should establish and maintain a system of internal accounting controls and keep detailed records of this system. Even with the passage of the FCPA, firms continued to struggle with the definition of strong internal control. Then, in 1978, the Cohen Commission recommended that firms include within their financial statements a statement of negative

assurance regarding internal control.[1] The SEC considered this recommendation and subsequently issued a ruling calling for mandatory management reports on a firm's internal accounting control system. Since the AICPA was the responsible party in releasing audit standards during this time period, they were criticized for not providing adequate internal control guidance and answered this criticism by issuing Statement on Auditing Standards (SAS) No. 30, *Reporting on Internal Accounting Control*. This SAS provided guidance specifically related to terminology in the management report. Subsequently, SAS No. 55, *Consideration of the Internal Control Structure in a Financial Statement Audit*, was released in 1990. SAS No. 55 was more comprehensive and defined internal control in relation to three areas: (1) the control environment, (2) the accounting system, and (3) control procedures. SAS No. 55 was a move toward a broader definition of internal control.

The high inflation and interest rates of the late 1970s and 1980s coincided with the failure of many U.S. firms. Congress associated the failures with business and audit deficiencies and formed the National Commission on Fraudulent Financial Reporting to fulfill the role of examining these issues more closely. This commission later became known as the Treadway Commission and was composed of the Institute of Internal Auditors (IIA), the AICPA, Financial Executives International (FEI), the American Accounting Association (AAA) and the Institute of Management Accountants (IMA). From the Treadway Commission, the Committee of Sponsoring Organizations (COSO) was formed and this organization has focused on providing internal control guidance to

[1] Negative assurance informs users that no information came to the attention of the auditor that would suggest that a company is not in compliance with the requirements that are being attested to in the engagement.

firms. The COSO *Internal Control-Integrated Framework* was released in 1992 and this guidance provides a multidimensional description of internal control:

> *"Internal control is a process affected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in the following categories:*
>
> - *Effectiveness and efficiency of operations*[2]
> - *Reliability of financial reporting*
> - *Compliance with laws and regulations* (COSO 1992).

After the scandals at the turn of the century (Enron, Worldcom, Tyco, etc.), Congress intervened, once again, and passed the Sarbanes-Oxley Act of 2002 (SOX) on July 30, 2002. Among the sections included within the regulation, two sections, Sections 302 and 404, focus on internal control reporting and are specifically targeted towards companies that are required to file their financial statements with the Securities and Exchange Commission (SEC). A timeline illustrating the effective dates for Sections 302 and 404 is illustrated in Figure 2.1.

Section 302 became effective 30 days after the passage of SOX and requires the chief executive officer and the chief financial officer to certify each quarterly and annual report. These certifications must contain statements by the officers of the firm that they are responsible for the internal control within the organization, they have evaluated the effectiveness of the internal control systems, and they have disclosed any MW. Additionally, the officers must disclose any significant deficiencies in internal control to the audit committee, board, and company auditors (U.S. House of Representatives 2002).

[2] Operations management can be defined as "the design, operation, and improvement of the systems that create and deliver the firm's primary products and services" (Jacobs et al. 2009). The first component of internal control is most closely related to managerial accounting, whereas, the second component of internal control is most closely related to financial accounting.

Section 404 of SOX contains two reporting requirements. The first requirement is laid out in Section 404(a) and it stipulates that annual reports must contain a report from the company's management that assesses the effectiveness of the company's internal control over financial reporting. This requirement became effective at different stages depending on filing status.[3] Companies that are categorized as U.S. accelerated filers have been required to comply with Section 404(a) for all fiscal years ending on or after November 15, 2004. Companies categorized as non-accelerated filers have been required to comply with Section 404(a) for all fiscal years ending on or after December 15, 2007. The second requirement is laid out in Section 404(b) and requires the auditors of filers to attest to management's assessment of internal control effectiveness.[4] Accelerated filers are required to comply with Section 404(b) for all fiscal years ending on or after November 15, 2004. However, non-accelerated filers have been exempted from the auditor assessment requirement through the passage of the Dodd-Frank Act in 2010.

While SOX laid out the internal control responsibilities of top executives and management, the legislation failed to provide a definition of internal control. After

[3] Filers with the SEC can be categorized as either accelerated or non-accelerated filers. An accelerated filer is defined by the SEC as: "(1) the issuer had an aggregate market value of voting and non- voting common equity held by non-affiliates of the issuer of $75 million or more, as of the last business day of the issuer's most recently completed second fiscal quarter; (2) the issuer had been subject to the reporting requirements of Section 13(a) or 15(d) of the Exchange Act [15 U.S.C. 78m(a) or 78o(d)] for a period of at least 12 calendar months; (3) the issuer previously had filed at least one annual report; and (4) the issuer was not eligible to use Forms 10-KSB and 10-QSB [17 CFR 249.310b and 17 CFR 249.308b] for its annual and quarterly reports" (SEC 2005).

[4] Since the passage of Auditing Standard No. 5 (AS5), "An Audit of Internal Control Over Financial Reporting That Is Integrated with An Audit of Financial Statements," by the PCAOB, there has been some confusion as to the impact of reported MW on the auditor's financial statement opinion. Although the audits (the internal control audit and the financial statement audit) are performed in concert with one another, the opinions generated are separate. Just because a firm may report MW and subsequently extends a qualified internal control opinion, does not mean that the firm is then required to extend a qualified financial statement opinion. However, the presence of MW does signal to the auditor that the controls in question cannot be relied upon and as a result, they must perform additional tests to ensure the financial statements fairly present a firm's financial position.

Congress passed SOX, the SEC, as the regulatory reporting agency for publicly listed firms, was given enforcement responsibility over publicly listed firms. Within an earlier section of COSO's internal control guidance, COSO clearly states that "[p]roblems are compounded when the term [internal control], if not clearly defined, is written into law, regulation or rule" (COSO 1992). These problems were evident as accountants, once again, started questioning the broadness of the definition of internal control as it applied to SOX. As a result, the SEC released a report in 2003 stating that for reporting purposes auditors were only required to provide assurance related to internal controls over financial reporting, the second of three key components within the COSO definition (SEC 2003). [5]

In addition to providing guidance on the definition of internal control, the SEC provided filers with definitions for different categories of internal control weaknesses. A *significant deficiency* is defined as: "A deficiency, or a combination of deficiencies, in internal control over financial reporting that is less severe than a material weakness, yet important enough to merit attention by those responsible for oversight of the registrant's financial reporting" (SEC 2007a). Alternatively, a *material weakness* is defined as: "a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the company's annual or interim financial statements will not be prevented or detected on a timely basis" (SEC 2007b). Although firms are only required to specifically report MW in their Section

[5] The definitions presented within this section are generally presented as those that are used by external auditors in carrying out their duties with respect to the financial statement audit. However, internal auditors are also heavily involved in the internal control process and use the entire internal control definition (IIA 2008) that is proposed by COSO to carry out their duties (which include duties outside the realm of financial statements).

302 and 404 filings, management is required to communicate significant deficiencies to the audit committee, board, and external auditors.

### 2.3 International Response to Internal Control

Although the above discussion focuses upon the U.S. response to deficiencies in internal control, other countries have also significantly improved their internal control regulations. Canada, France, Japan, and the United Kingdom are among the many countries that have been involved in the movement towards a more transparent internal control environment.

Canada has followed a "watch and see" approach to implementing their internal control legislation. Similar to SOX, the Canadian legislation relates only to internal control over financial reporting and Canada has followed the U.S in utilizing the COSO definition of internal control and the COSO framework for internal control.[6] Bill 198 was passed in Ontario, Canada in October of 2002 as Canada's SOX equivalent (Ecker 2002). The largest stock exchange in Canada, TSX, is located in Toronto and thus, this legislation applies to most Canadian public companies. Full compliance with Bill 198 was not required until 2008 and the legislation includes guidelines and timetables that companies can follow in attaining complete compliance. Bill 198 requires that firms review and document their internal controls. Similar to SOX Section 302, Canada also passed MI 52-109, which requires executives to provide an internal control certification within both their quarterly and annual reports. Bill 198 documentation should support the executive certifications that are required through MI 52-109 (MI 2005).

[6] However, Canada leaves the framework up to the firm's discretion and the Turnbull Guidance (U.K) and CoCo (Canada) are also acceptable frameworks that can be used in establishing internal control systems.

Up until 2008, Canadian firms were not required to report on any MW beyond those that are reported in the executive certifications. However, MI 52-109 was amended in late 2008 and firms are now required to report MW in their MD&A. In contrast to SOX 404(b), Canada does not require external auditors to attest to management's assessment of internal control. The Canadian internal control requirements were combined into one piece of legislation in October 2008 as NI 52-109 (NI 2008).

France passed the Financial Security Act (LSF) on August 1, 2003, as their form of internal control regulation (LSF 2003). LSF has many financial reporting and internal control provisions that are similar to SOX. However, unlike SOX, LSF uses a broader definition of internal control that includes not only internal control over financial reporting, but it also requires that firms document all of their business processes. In addition to LSF applying to public companies, any firm that has a board of directors, or a management board, or is involved in an IPO needs to comply with the regulations. Rather than management submitting documentation on internal controls, it is the board chairman that is responsible for reporting on the internal controls of the firm. The reports by the board chairman are similar to those that are defined within SOX 404. Additionally, auditors are required to submit a report on their audit of the board's assessment of internal control, similar to SOX 404(b).

Japan passed the Financial Instruments and Exchange Act (FIE), in June of 2006, as their form of explicit internal control regulation. The FIE closely mirrors SOX along a set of different dimensions that include: definitions, reporting requirements, framework and method of reporting deficiencies. Similar to SOX, the FIE relates only to internal control over financial reporting and Japan has followed the U.S in utilizing the COSO

definition of internal control. All public companies are required to comply with FIE if they are listed on the Japanese exchanges and two reports must be included within public filings, a management report and an auditor's report. FIE designates that the five components of the COSO framework should be used as guidance in defining and establishing internal control systems.[7] FIE also defines MW as the most severe form of internal control deficiency and requires that all MW be reported in both the management report and the auditor's report.

While the above FIE requirements have significant ties to SOX, differences do exist. As noted in the previous section, SOX requires only accelerated filers to file both a management report and an auditor's report. However, the FIE requires all firms, regardless of size, to file both reports. Additionally, within these reports, firms are required to include a specific response on the steps the firm is taking to establish strong controls over their information technology. Although other countries have stated the importance of information technology within their internal control guidance, specific information technology reporting requirements are found only within FIE. One of the many SOX complaints that has been cited by firms is that specific guidance on how to comply is not available. The FIE has provided specific implementation guidance to aid firms in establishing strong internal control systems.

The internal control regulations discussed above are rules-based. The U.K. has taken a different approach and has internal control regulations that are primarily principles-based. The U.K. passed their internal control legislation in 2006. Firms are prompted to develop and maintain strong internal control systems, with a definition of

[7] The five components of the COSO framework are (1) control environment, (2) risk assessment, (3) control activities, (4) information and communication, and (5) monitoring. The U.S. also suggests that this guidance be used for companies that are working towards SOX compliance.

internal control that includes (1) control over financial reporting, (2) controls related to the efficiency and effectiveness of operations, (3) controls governing compliance with laws and regulations, and (4) risk management. The firm internal control reporting process also differs within the U.K. Firms are required to have an overall internal control assessment that is completed by the board rather than management and auditor assessments. Additionally, firms follow a "comply or explain" approach. Under the "comply or explain" approach, a firm is required to explain, if they did not comply, any and all reasons why internal control compliance was not achieved. Firms in the U.K. follow the Turnbull Guidance for Internal Control to achieve compliance with regulations. The Turnbull Guidance is also used as a framework to develop internal control systems. This guidance is based upon COSO and includes the five COSO components. Severe deficiencies in internal control are referred to as significant failures and should always be reported in addition to MW.

Table 2.1 provides a summary of the different types of internal control legislation that are discussed above.

## 2.4 Internal Control Literature Related to SOX

Internal control has been a predominant topic in the accounting literature for decades (e.g., see Bower and Schlosser, 1965; Yu and Neter, 1973; Cushing, 1974). Although firms were required to maintain adequate systems of internal control prior to SOX, the disclosure of internal control was limited to situations (i.e., a change in auditor) that required the filing of an 8-K form (SEC 1988). The absence of firm specific internal control information inhibited internal control research that could examine the impact of poor internal control on firm specific factors. Since the passage of SOX, the internal

control information provided through quarterly and annual financial reports has been used to more fully examine the economic impact of poor internal control.

### 2.4.1 Determinants of Internal Control Weaknesses

The first studies to utilize firm specific internal control information examined the determinants of weaknesses in internal control over financial reporting. Prior to SOX, Ge and McVay (2005) found that companies that report MW are smaller, more complex and less profitable than firms that do not report MW. Doyle et al. (2007a) confirm Ge and McVay (2005) and also find that younger firms and firms that have recently exhibited signs of rapid growth and restructuring are more likely to report MW. Also, these results are more prominent in firms that report entity-level MW, as opposed to account-specific MW (Doyle et al. 2007a). In addition to confirming the prior determinant results, Ashbaugh-Skaife et al. (2007) find that firms with fewer resources to devote to internal control, and firms that "face greater control risk . . . and have greater reporting incentives" (Ashbaugh-Skaife et al. (2007) are more likely to report MW.

### 2.4.2 Financial Reporting Quality and Internal Control

Recent research also documents that firms that report MW also have lower earnings quality, proxied by accruals, compared to firms that do not report MW (Ashbaugh-Skaife et al. 2008; Doyle et al. 2007b). Chan et al. (2008) note evidence of a positive relation between reported MW and earnings management. Since earnings management and accrual quality have a direct effect on FRQ, one noted benefit of SOX compliance is increased FRQ. Nagy (2010) find that compliance with and strong internal control reporting under Section 404 of SOX is leading to the improvement in the quality of financial reports. Feng et al. (2009) find evidence to support the conjecture that

managers within firms that report MW are more likely to be relying on inaccurate data when forming and making management guidance disclosure decisions. Goh and Li (2011) find a positive relation between conservatism and internal control quality, as proxied by the presence or absence of MW. Additionally, some researchers are using the presence or absence of MW as a proxy for FRQ (Cheng et al. 2011; Costello and Wittenberg-Moerman 2011). Chapter 3 develops this research and uses MW as a proxy for FRQ.

### 2.4.3 Firm Performance and Internal Control

One of the more popular recent streams in the internal control literature examines the association between internal control and firm performance. Hammersley et al. (2008) and Kim and Park (2009) find a negative stock price reaction is related to disclosing MW under Section 302 of SOX. Similarly, Beneish et al. (2008) find that reporting Section 302 MW results in negative abnormal returns. On the other hand, Section 404 MW do not significantly impact stock prices (Beneish et al. 2008). Additionally, Beneish et al. (2008) find that accelerated filers have significantly lower negative stock market returns than non-accelerated filers.

In addition to stock market returns, researchers have also examined if there is an impact on cost of capital for firms that report MW. This research builds upon the work of Lambert et al. (2007) that theoretically argues internal control weaknesses impact the quality of a firm's accounting information disclosures and subsequently increase firms' cost of equity. Ogneva et al. (2007) do not find evidence that a higher cost of equity is associated with reporting SOX Section 404 MW, after controlling for firm characteristics and predicted analyst forecast error. Consistent with these results, Beneish et al. (2008)

also find no significant relation between SOX Section 404 MW and a higher cost of equity. However, Beneish et al. (2008) do find a higher cost of equity is associated with the disclosure of SOX Section 302 MW.

In contrast to the research noted above, Ashbaugh-Skaife et al. (2009) find a significant increase in cost of equity among firms that report Section 404 MW and firms that report Section 302 MW but subsequently file clean Section 404 reports. Additionally, Ashbaugh-Skaife et al. (2009) find that MW remediation improves (lowers) the cost of equity. Gordon and Wilford (2012) provide strong evidence, based on analyses of consecutive MW over a six-year period, that an increase in cost of equity is associated with reporting MW and the negative impact on firm cost of equity from reporting MW in one year is substantially lower than reporting MW in two, three, and four consecutive years. Gordon and Wilford (2012) reconcile the mixed results in the prior research and they find that it is the remediation of MW that leads to a decrease in the cost of equity for firms that report MW.

Although empirical research related to equity funding has been the focus of research, new databases are now providing the opportunity to examine the impacts of different factors on debt funding. Dhaliwal et al. (2011) examine whether SOX provides new information to the public debt market, resulting in changes to the cost of debt. They find that an increased cost of debt is more pronounced with firms that report MW and are monitored by credit rating agencies and/or banks. In line with the results obtained by Dhaliwal et al. (2011), Kim et al. (2011) find that firms that report MW experience greater direct and indirect debt costs than firms that do not report MW. Also, this study notes that banks charge higher interest rates to firms that report MW (Kim et al. 2011).

### 2.4.4 Audit Fees and Internal Control

Because of the significant role played by auditors in determining the effectiveness of accelerated filers' internal control systems, the changes in internal control regulation have had a significant impact on audit fees. Research notes that increased audit fees are associated with firms that report Section 404 MW (Raghunandan and Rama 2006; Hoitash et al. 2008). Additionally, Hoitash et al. (2008) find that audit fees are also higher in firms that report MW compared to firms that report significant deficiencies. Ettredge et al. (2007) find that firms that pay higher audit fees in the post-SOX environment are more likely to dismiss their auditors and dismissals are more likely in firms that report MW. Hogan and Wilkins (2008) show that firms that report more severe MW will experience higher fee increments and have higher levels of inherent risk and information risk. Also, research indicates that the relation between audit fees and financial reporting risk increased dramatically in 2002 in response to the increased business and litigation risk resulting from SOX (Charles et al. 2010).

In response to critics denouncing the high costs associated with SOX, Munsif et al. (2011) and Hoag and Hollingsworth (2011) use four consecutive years of data to examine how audit fees are affected by the remediation (correction) of MW and find that firms that remediate their MW have lower audit fees compared to firms that do not remediate their MW. Also, audit fee premiums continue to be paid up to two years following remediation by firms that have reported MW compared to firms that have not previously reported MW (Munsif et al. 2011; Hoag and Hollingsworth 2011). Kinney and Shepardson (2011) use a natural experimental to assess the change in audit fees for non-accelerated filers versus accelerated filers in a post-SOX era and find that management

internal control reports and financial statement audits are a cost-effective way of enforcing SOX for small firms.

### 2.4.5 The Auditor/Firm Relationship and Internal Control

Auditor dismissal research suggests that subsequent auditors give audit fee discounts to clients. However, Huang et al. (2009) find that initial clients of Big 4 auditors enjoy an audit fee premium in the post-SOX environment. Ettredge et al. (2011) attempt to identify the determinants of auditor dismissal in the post-SOX environment using a sample of four consecutive years and find that the presence of MW is the most significant factor associated with auditor dismissals. Landsman et al. (2009) examine whether there is a change in the sensitivity of auditor changes to client risk and misalignment after SOX and find that there is not a difference in the sensitivity of auditor switches to client risk. They do find that changes in auditors in the post-SOX environment are a function of the need to rebalance client portfolios in response to capacity constraints that are a result of the increase in client requirements.

### 2.4.6 The Audit Committee and Internal Control

In addition to the new internal control requirements, SOX imposes additional restrictions regarding the audit committee. In the post-SOX environment audit committees are required to be one hundred percent independent and one of the members of the committee is required to be classified as a financial expert (inclusive of both accounting and non-accounting financial experts). Defond et al. (2005) and Hoitash et al. (2009) find that a positive market reaction is significantly associated with the appointment of accounting financial experts to the audit committee, but no market reaction appears to be associated with the appointment of non-accounting financial

experts. There is also evidence that the presence of accounting financial experts on the audit committee impacts the effectiveness of internal control. Naiker and Sharma (2009) identify that there is a negative association between the presence of former audit partners on the audit committee and the presence of MW. Krishnan et al. (2011) find that more socially connected directors are chosen in the post-SOX time period. Additionally, there is a positive relation between the ties connecting boards and upper management and earnings quality (Krishnan et al. 2011).

Similarly, using pre-SOX internal control data obtained through 8-K reports, Krishnan (2005) finds that audit committees that are independent and have a financial expert are less likely to report MW. Recognizing the importance of the audit committee in the quality of financial reporting post-SOX, Beasley et al. (2009) interview members of various audit committees and find responses to internal control questions tend to vary dependent upon member appointment date (pre- or post-SOX), confirming the differences in the experience of individuals that are appointed post-SOX (i.e., individuals with more internal control experience are appointed post-SOX). Finally, Engel et al. (2010) find that audit committee compensation is positively associated with the demand for monitoring (as measured by audit fees and SOX impact).

### 2.4.7 Economic Consequences of SOX

Internal control research in the post-SOX era has also examined the economic impact associated with SOX. Zhang (2007) finds that firms that are impacted by SOX experience negative cumulative abnormal returns around the legislative events occurring before and after the passage of SOX. The impact of SOX on listing decisions appears to have been the most significant consequence of SOX. Leuz et al. (2007) find that the

increased cost of SEC disclosure brought about through the passage of SOX legislation has resulted in a significant increase in the number of firms that file for deregistration. Also, Engel et al. (2007) find a significant increase in the number of going private decisions following the passage of SOX and attribute this increase to SOX compliance costs. Piotroski and Srinivasan (2008) examine the probability of foreign firms listing on the U.S. exchanges versus the U.K. stock exchanges. Their results indicate that large foreign firms continue to be drawn to the U.S. stock exchanges; however, small foreign firms are more likely to list on the U.K stock exchange in the post-SOX environment.

Another unintended consequence of SOX legislation is captured through a study that exploits the natural test environment that is available due to the permanently delayed compliance requirements for non-accelerated filers. Gao et al. (2009) find that non-accelerated filers have incentives to remain small to avoid additional regulatory disclosure and do so by investing less, increasing dividend payouts and increasing negative disclosures.

Although a significant portion of the research on the SOX impact focuses upon the negative consequences associated with the legislation, there have also been positive consequences. Patterson and Smith (2007) employ a theoretical model to illustrate that SOX improves internal control within the audit function by reducing the incidence of fraud. Additionally, although audit costs increase in the short-run, in the steady-state, equilibrium audit costs are expected to decrease and audit efficiency is expected to increase (Patterson and Smith 2007).

Even though firms have reported significant costs related to expanded audits, Bedard and Graham (2011) use proprietary data obtained through audit firms and report

that auditors detect approximately three-fourths of reported MW. This result suggests that there is significant value that is attached to the Section 404(b) auditor assessment filing requirements. Additionally, Kinney and Shepardson (2011) find that first-time non-accelerated 404(a) firms experience MW disclosure rates that are comparable to the first-time MW disclosure rates for accelerated firms that are required to file reports in compliance with both Section 404(a) and 404(b). However, Kinney and Shepardson (2011) are not able to capitalize on the richness of the data used by Bedard and Graham (2011) and their results could be significantly affected by this difference.

Research focusing upon the economic consequences of SOX has also found that corporate risk-taking (Bargeron et al. 2010) and option backdating have declined (Dhaliwal et al. 2009) post-SOX. Also, SOX appears to have reduced the opportunities for strategic accrual manipulation (Comprix and Muller 2011). Another unintended consequence of SOX is illustrated in a study by Gordon et al. (2006). They find evidence to suggest that information security activites receive more attention in the post-SOX environment (Gordon et al. 2006).

### 2.4.8 The Relation Between Corporate Governance and MW under SOX

Audit committee characteristics and board quality characteristics have been used as proxies for corporate governance. Research indicates that firms are less likely to report Section 404 MW when they have a higher level of corporate governance quality (Hoitash et al. 2009). Also, the types of MW that are reported vary depending on the experiences of the members of the audit committee and the board of directors (Hoitash et al. 2009). Auditors have anecdotally recognized the changes in corporate governance that are reported in the empirical research. According to interviews with external auditors, there

have been significant and positive changes in corporate governance (i.e. board of directors, audit committee, control environment, etc.) in the post-SOX environment (Cohen et al. 2010). When MW are present, Goh (2009) finds that a significant and positive association exists between firms with larger audit committees, audit committees with greater non-accounting financial expertise, and more independent boards and timely remediation of those MW.

Another aspect of corporate governance relates to the qualifications of financial executives. Li et al. (2010) find evidence that firms with MW are more likely to have a chief financial executive with less experience. Wang (2010) and Johnstone et al. (2011) find that chief financial officers of companies with poor internal control receive lower compensation and their turnover rates are higher. Furthermore, remediation of MW is positively associated with an increase in the turnover of audit committee members and an increase in the proportion of independent board members (Johnstone et al. 2011).

### 2.4.9 Information Technology and Internal Control

Research that focuses on the impact of SOX and on the information technology environment has been gaining traction in the current literature. COSO specifically identifies information technology as a vehicle that should be used to enhance and strengthen the control environment. Masli et al. (2010) document that internal control monitoring technology is associated with a lower likelihood of reported MW, smaller audit fee increases, and smaller audit delay increases. Klamm and Watson (2009) find evidence that firms that report information technology MW report a greater number of MW than firms that do not report IT-related MW. This research indicates that IT MW have a pervasive and negative impact on the firm.

Wallace et al. (2011) implement an exploratory research design to identify the most and least commonly implemented IT controls and find that differences between firms exist based on firm size, industry and status (public vs. private). Enterprise Resource Planning systems are able to take advantage of the new focus on internal controls because of the "built-in" controls feature. An investigation of firms with ERP systems compared to firms without ERP systems finds that firms with ERP systems are less likely to report MW (Morris 2011).

Arnold et al. (2007) find that there is a substantial need for research on emerging technologies that will help to alleviate the challenges faced by smaller firms in complying with Section 404 requirements. Trompeter and Wright (2010) provide results to a study that suggests technological advances and audit approaches have facilitated a change in analytical procedural practices. Additionally, SOX and financial scandals have driven the change in analytical procedure practices (Trompeter and Wright 2010).

### 2.4.10 Shareholders and Internal Control

One stakeholder group being examined more closely within the internal control environment is the shareholder group. Using a sample of firms that report Section 404 MW, Hermanson et al. (2009) find that shareholders perception of the audit internal control opinion is tied to the presence of restatements and the categories of MW reported. They find that shareholders appreciate auditors that report company-level MW with no restatements. However, if an auditor reports non-company-level MW with a restatement, shareholders hold the auditor partly responsible (Hermanson et al. 2009). Further, Hochberg et al. (2009) find evidence that shareholders lobbied in favor of the strict

implementation of SOX that expanded the definition to include the efficiency and effectiveness of operations.

Cassar and Garakos (2010) provide a first look at the hedge fund determinants of internal controls and fund fees. They find that internal controls are stronger in hedge funds with high agency costs located in areas with limited legal repercussions (Cassar and Garakos 2010). Also, they find manager profit is positively and significantly associated with strong internal control systems. MW also impact investor perceptions of investment risk (Rose et al. 2010). More specifically, Rose et al. (2010) find that investors adjust their assessments of investment risk based on MW pervasiveness and detail disclosure. DeFond et al. (2011) find a decline in bondholder value is associated with events tied to SOX.

## 2.5 Summary

Table 2.2 summarizes the key points from the literature that is reviewed above. The strength of an internal control system within the firm has been studied extensively as a result of the firm specific internal control information that is now available because of the SOX requirements. However, internal control is not a new topic and has been discussed extensively by various stakeholders for decades. Within this chapter, I provided a brief historical overview of the role of internal control and the regulations that are in force today, both domestically and internationally. Finally, I have provided a brief overview of the current literature that has resulted in consequence of the passage of SOX.

This overview of the literature is in no way meant to be taken as a comprehensive account, but rather to provide a feel of where we have been and where we are going. As can be seen from the review above, MW have been examined extensively in the context

of how they apply to SOX. More recently, the MW have been used as a proxy for financial reporting quality. Future research could build off of the concept of using MW as a proxy to examine a variety of issues. I build on this stream of research and use MW as a proxy for financial reporting quality to examine the impact of financial reporting quality on investment efficiency in the chapters that follow.

# Chapter 3 Investment Efficiency and Financial Reporting Quality: Introduction

## 3.1 Introduction

The increased attention to internal control and the associated internal control disclosure requirements provide an opportunity to examine internal control in the context of financial reporting quality (hereafter, FRQ). Prior research recognizes that there is a significant relation between material weaknesses in internal control over financial reporting (hereafter, MW) and the quality of accounting information. Lambert et al. (2007) theoretically establish "that the quality of accounting information influences a firm's cost of capital through its effect on a firm's real decisions" (Lambert et al. 2007, 388).

Three direct links have been made to Lambert et al. (2007) with respect to MW. First, Doyle et al. (2007b) and Ashbaugh-Skaife et al. (2008) empirically examine the relation between MW and FRQ, using accruals quality as a proxy, and find that lower FRQ is significantly associated with MW disclosure. Second, Beneish et al. (2008), Ashbaugh-Skaife et al. (2009) and Gordon and Wilford (2012) document that firms that disclose MW have a higher cost of capital compared to firms that do not disclose MW. As a precursor to the third link, Feng et al. (2009) and Li et al. (2012) document a relation between MW disclosure and less accurate management forecasts. Less accurate management forecasts and inefficient real investment decisions are the result of poor FRQ. The third and final link, that has been briefly but not thoroughly explored, examines the effect of FRQ, upon a firm's real investment decisions (Biddle and Hillary 2006; Biddle et al. 2009; Chen et al. 2011).

Biddle and Hillary (2006) find that higher FRQ improves investment efficiency. Furthermore, Biddle et al. (2009) find that overinvestment and underinvestment are both reduced as FRQ increases. Chen et al. (2011) extend this research to private firms in emerging industries and confirm the prior results in the private industry context. The above noted research recognizes the relation between FRQ and real investment decisions. However, the effect of remediation, as a monitoring mechanism, and also the potentially detrimental effects of reporting MW in multiple years has not been examined. Furthermore, prior research has not considered whether the investment specific MW have a varying impact on investment decisions compared to the other types of MW.

The primary objective of this study is to empirically examine the relation between FRQ, as proxied by MW, and real investment decisions. Recent research has used MW as a proxy for FRQ (Cheng et al. 2011; Costello and Wittenberg-Moerman 2011). More specifically, particular emphasis is given to examining the way FRQ issues (MW) in multiple consecutive years affect a firm's real investment decisions, as well as the effect of the correction/remediation of FRQ issues on the FRQ-investment efficiency association. The current study also examines whether the investment decisions of firms that have reported FRQ issues (MW) associated with investment related accounts vary from firms that do not report issues in investment related accounts.

The current study utilizes a dataset that contains a large sample of firms that report FRQ issues in two years, as well as firms that report FRQ issues in three, four, five, and six years. Thus, I differentiate between firms that report FRQ issues in only one year and firms reporting FRQ issues in two or more consecutive years. As such, this study examines whether the decrease in investment efficiency following disclosure is due

to remediation rather than disclosure (Cheng et al. 2011). Whereas Biddle et al. (2009), focus on the effects that FRQ has upon agency concerns (i.e. adverse selection and moral hazard), the current study focuses upon how correction/remediation of FRQ issues effects investment efficiency.

The results of this study indicate that reporting FRQ issues (MW) in multiple consecutive years will have an increasingly significant and negative impact upon investment efficiency. Furthermore, it is the remediation of FRQ issues that results in an increase in investment efficiency rather than the disclosure of FRQ issues. Additionally, I find that even though firms report multiple types of FRQ issues, it is the investment specific FRQ issues that are driving the investment inefficiencies.

## 3.2 Background on Investment

### 3.2.1 Determinants of Investment

An extensively large body of accounting, economics, and finance literature focuses on a broad range of topics related to investment. Early investment research focused on determinants of investment and two main theories were developed. Within the first theory, Meyer and Kuh (1957) stress that financing constraints are the main determinant contributing to business investment. Fazzari and Athey (1987) support the prior theoretical finding using interest and cash flow information within an empirical study. As a second theory, Modigliani and Miller (1958) find that certain conditions lead to the irrelevance of financial structure when making real investment decisions and focus on decisions that will maximize shareholder wealth. Elliott (1973) finds, within his extensive research, that an ideal model of investment is still an open question. Fazzari et al. (1988) agree with Elliott (1973) and note that additional theoretical and empirical

research is needed to examine the role that financial constraints play in the investment decision. In a recent capital-market investments review, Hubbard (1998) notes clarity on the investment decision is still not available and "more research is needed to isolate the sources of . . . imperfections that affect firm decisions" (Hubbard 1998, 222). Furthermore, Gordon et al. (2006) comment that "[management accounting systems], should play an important role in rectifying informational impediments to capital investments" (Gordon et al. 2006, 162).

Although different investment models have appeared throughout the capital investment literature, Nair (1979) suggest that the accounting information used to make economic decisions can have an impact. The work by Nair (1979) alludes to the importance of FRQ in the investment decision. Much of the investments research in the accounting literature examines the relationship between investment expenditures and management decisions. Jackson (2008) finds evidence that suggests investment decisions are affected by the depreciation method employed. Additionally, Larcker (1983) and Waegelein (1988) examine the relation between capital investments and performance plan adoption. Biddle and Hilary (2006) find evidence that investment decisions at the firm-level are significantly effected by FRQ. More broadly, they suggest that FRQ may be used as a tool to mitigate investment inefficiency (Biddle and Hilary, 2006) and Biddle et al. (2009) find evidence that higher levels of FRQ do decrease both overinvestment and underinvestment.

### 3.2.2 Internal Control and Capital Investments

SOX contains Sections 302 and 404 that substantially increase firms' responsibility for and disclosure of items related to internal control systems over financial

reporting. The increased disclosure of internal control activities has resulted in increased firm specific internal control data. This data has been used to examine the consequences associated with weak internal control systems and their subsequent disclosure. Initial studies have found that firms reporting MW are smaller, younger, financially weaker (Doyle et al. 2007a; Ashbaugh-Skaife et al. 2007), and have a lower level of FRQ (Doyle et al. 2007b; Ashbaugh-Skaife et al. 2008), as proxied by accruals quality. Firms reporting MW also have higher costs of capital (Beneish et al. 2008; Ashbaugh-Skaife et al. 2009; Gordon and Wilford 2012) and higher audit fees (Raghunandan and Rama 2006; Hoitash et al. 2008).

One of the overarching themes that appears within the above research is that disclosure of MW is a signal to the market of poor FRQ. Lambert et al. (2007) capture this argument in their theoretical work that establishes a connection between FRQ and its effect on real investment decisions. Subsequently, real investment decisions impact cost of capital (Lambert et al. 2007). Doyle et al. (2007) "find that weaknesses are generally associated with poorly estimated accruals that are not realized as cash flows" (Doyle et al. 2007b, 1141). Similarly, Ashbaugh-Skaife et al. (2009) find that firms that report MW appear to have a lower level of FRQ.

Following the empirical evidence that a relation exists between FRQ and MW, research has also established that firms that report MW also have higher costs of capital compared to firms that do not report MW. Beneish et al. (2008) report that firms that disclose Section 302 MW exhibit a significant increase in cost of equity. Ashbaugh-Skaife et al. (2009) also document a higher cost of capital is associated with reporting MW using a mixed sample of Section 302 and Section 404 disclosures. Gordon and

Wilford (2012) reconcile these mixed results and find clear evidence to support the hypothesis that MW disclosed through Section 404 reports lead to a higher cost of capital. Additionally, it is the remediation of MW that leads to a decrease in cost of capital.

As seen from the research cited above, the relation between FRQ, cost of capital, and MW has been clearly established in the literature. However, Lambert et al. (2007) also link FRQ, which is clearly linked MW, to real investment decisions. The Lambert et al. (2007) model suggests "information quality is important because it affects the market's ability to direct firms' capital allocation choices" (Lambert et al. 2007, 409). Additionally, Feng et al. (2009) establish a link between MW disclosure and management forecast accuracy. They find that MW "not only [have] implications for reported earnings. . . , but also likely [affect] internal reports used by management to form projections such as earnings expectations" (Feng et al. 2009, 207).

Biddle and Hillary (2006) find that higher FRQ improves investment efficiency by reducing information asymmetry. Furthermore, Biddle et al. (2009) build upon this research and find that a higher FRQ, proxied by accruals quality, reduces both overinvestment and underinvestment. Chen et al. (2011) extend this research, that is focused upon large U.S. publicly traded companies, to a set of private firms in emerging markets and confirm that under these conditions FRQ is also positively related to investment efficiency. A recent working paper by Cheng et al. (2011) re-examines the link between FRQ, proxied by MW, and investment efficiency using the empirical models developed through Biddle et al. (2009). The main focus of Cheng et al. (2011) revolves around the disclosure of MW and they suggest that their results provide

evidence that disclosure mitigates investment inefficiency because of the subsequent reduction in information asymmetry (Cheng et al. 2011). However, merely disclosing MW does not resolve poor FRQ. As discussed previously, Feng et al. (2009) find that MW lead to poor management guidance accuracy and this could subsequently impact managers' real investment decisions.

Cheng et al. (2011) provide a first glance at the effects of MW upon real investment decisions. However, it is unclear whether the mitigation of investment inefficiencies are a result of MW disclosure or MW remediation. Additionally, Cheng et al. (2011) do not examine how continuing to report MW in multiple consecutive year impacts investment efficiency. Cheng et al. (2011) utilize a mixed sample of MW firms even though key distinctions exist between Sections 302 and 404 of SOX.

# Chapter 4 Investment Efficiency and Financial Reporting Quality: Research Design

## 4.1 Hypotheses

Based on the above discussions, it is reasonable to believe that MW are directly linked to FRQ and subsequently managerial decisions. Biddle et al. (2009) recognize and find evidence that increased FRQ mitigates investment inefficiencies. Cheng et al. (2011) provide a follow-up study to Biddle et al. (2009) and find evidence that MW disclosure also mitigates investment inefficiency. However, merely disclosing MW will not increase the quality of financial information. In fact, Feng et al. (2009) find that it is the presence of MW that leads to inaccurate management guidance and these MW result in lower FRQ. Instead of focusing on disclosure as the mechanism that improves FRQ, considering remediation over multiple years may lend support to and provide a greater understanding of how MW, as a proxy for FRQ, can impact real firm investment decisions.

Evidence from Gordon et al. (2012) reveals that although some firms will quickly remediate their MW following disclosure, other firms are slow to remediate and will report MW in two, three, or even more consecutive years. Thus, while Cheng et al. (2011) note that firms that report FRQ issues (MW) in a single year experience investment inefficiencies, continuing to report FRQ issues (MW) in multiple consecutive years may act as a signal that firms with MW are ineffectively monitoring. Additionally, it is these later firms (i.e., firms reporting MW in multiple consecutive years), in particular, where we would expect to empirically observe greater investment inefficiency

as a result of reporting FRQ issues (MW). This leads to the following two general hypotheses (stated in the alternative form).

> **H1: Disclosing FRQ issues (MW) within a particular year will result in a higher level of investment inefficiency.**
>
> **H2: Disclosing FRQ issues (MW) within multiple consecutive years will have a larger impact on investment inefficiency for those firms making such disclosures than for firms that do not report FRQ issues (MW) in consecutive years.**

As firms continue to report FRQ issues (MW) in multiple consecutive years, real investment decisions will continue to be impacted. I expect that greater investment inefficiency will be perpetuated as a result of the inaccuracies in the internal information managers are using to make decisions (Feng et al. 2009). As a corollary to the second hypothesis noted above, I examine a third hypothesis that is stated below (stated in the alternative form):

> **H3: The greater the number of multiple consecutive years that FRQ issues (MW) are disclosed, the larger the investment inefficiency for firms making such disclosures.**

Until recently the bulk of the internal control literature has centered around defining the strength of internal control dichotomously as the presence or absence of MW (Ashbaugh-Skaife et al. 2007; Ashbaugh-Skaife et al. 2008) or a break-down of MW based upon a categorization of MW as either account-specific or entity-level (Doyle et al. 2007a; Doyle et al. 2008; Beneish et al. 2008).[8] As more information is being made available through databases, research is now beginning to examine the effects that specific types of MW have on firm performance and or managerial decisions (Feng et al.

[8] As cited, research has noted that not all MW have the same impact. Although MW have been examined as entity-level versus account-specific, research has not yet examined whether an index can be constructed based on the specific types of MW reported within firms. Within Appendix B, I attempt to draw upon Analytic Hierarchy Process (AHP) methodology to develop a metric of internal control strength based on the specific types reported MW.

2009; Masli et al. 2010; Li et al. 2011). Prior FRQ – investment efficiency research has not examined the impact of investment specific FRQ issues on investment efficiency. This leads to our fourth hypothesis (stated in the alternative form):

> **H4: FRQ issues (MW) related to investment are more significantly related to investment inefficiency than other categories of FRQ issues.**

## 4.2 Empirical Study Development

### 4.2.1 Methodology

To test the hypotheses defined in the previous section, I use the following OLS regression models to examine how FRQ issues (MW) in the current year impact firm investment efficiency the following year. All of the variables included in the models are defined in Appendix A.

$$\begin{aligned} INVSTEFFi_{i,t+1} = {} & \beta_0 + \beta_1 * MW_{i,t} + \beta_2 * MKT\_CAP_{i,t} + \beta_3 * AGE\_FIRM_{i,t} + \beta_4 * LOSS_{i,t} \\ & + \beta_5 * FCR_{i,t} + \beta_6 * SL\_GR_{i,t} + \beta_7 * M2B_{i,t} + \beta_8 * CF_{i,t} + \beta_9 * SDCF_{i,t} \\ & + \beta_{10} * SDS_{i,t} + \beta_{11} * SDI_{i,t} + \beta_{12} * TNGBTY_{i,t} + \beta_{13} * KSTR_{i,t} + \beta_{14} * MKSTR_{i,t} \\ & + \beta_{15} * OPCY_{i,t} + \beta_{16} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (1)$$

$$\begin{aligned} INVSTEFFi_{i,t+1} = {} & \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} \\ & + \beta_5 * MKT\_CAP_{i,t} + \beta_6 * AGE\_FIRM_{i,t} + \beta_7 * LOSS_{i,t} \\ & + \beta_8 * FCR_{i,t} + \beta_9 * SL\_GR_{i,t} + \beta_{10} * M2B_{i,t} + \beta_{11} * CF_{i,t} + \beta_{12} * SDCF_{i,t} \\ & + \beta_{13} * SDS_{i,t} + \beta_{14} * SDI_{i,t} + \beta_{15} * TNGBTY_{i,t} + \beta_{16} * KSTR_{i,t} \\ & + \beta_{17} * MKSTR_{i,t} + \beta_{18} * OPCY_{i,t} + \beta_{19} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (2)$$

To adjust standard errors for heteroskedasticity, serial-, and cross-sectional correlation, I use a two-dimensional cluster at the firm and year level (Petersen 2009; Gow et al. 2010). To account for potential industry trends that may arise while using panel data, I account for industry fixed-effects using the Fama and French (1997) 48-industry classification. In line with other comparable research (Biddle et al. 2009; Cheng

et al. 2011) and to limit the influence of outliers, I winsorize all continuous variables at the 1 percent and 99 percent levels.[9]

### 4.2.2 Dependent Variable

Prior investment efficiency research (e.g. Biddle et al. 2009) measures investment efficiency (*INVSTEFF1*) through a model of investment as a function of sales growth opportunities. The residuals of this model are then used as firm-specific proxies of investment efficiency. This model is described below:

$$INVST_{i,t+1} = \beta_0 + \beta_1 * SaleGR_{i,t} + \varepsilon_{i,t+1} \quad (3)$$

where:

$$\varepsilon_{i,t+1} = INVSTEFF1_{i,t+1}$$

Within the model described as equation (3), I measure $INVST_{t+1}$ as a firm's total investment and calculate it as the sum of research and development, capital, and acquisition expenditures less any sales of property, plant or equipment. This value is then multiplied by 100 and divided by lagged total assets. $SaleGR_{i,t}$ is measured as the percentage growth in sales from year t-1 to year t.[10] The deviations from expected investment can present themselves as either negative residuals (underinvestment) or positive residuals (overinvestment). Both categories are considered inefficient investments. The investment model, described as equation (3), is estimated cross-sectionally, by the Fama and French (1997) industry categorization, for all year-industry groupings that contain at least 10 observations. I reduce any influence that outliers may

[9] We also perform all analyses that are described below using non-winsorized data and the results remain consistent with those reported upon in the current study.

[10] Biddle et al. (2009) recognize that the corporate finance literature uses Tobin's Q as the proxy for growth opportunities (Hubbard 1998). However, an actual measure of Tobin's Q is difficult to measure and as a result they substitute sales growth into the equation (3) investment model. In untabulated results I estimate investment efficiency using Tobin's Q, proxied by M2B, and obtain similar results.

have by winsorizing all variables at the 1 percent and 99 percent levels. All observations are then categorized as overinvestment observations or underinvestment observations based on their residuals.

As an alternate measure of investment efficiency (*INVSTEFF2*), I use a modified version of equation (3) that has also been used in prior research to examine the relation between investment efficiency and FRQ (Chen et al. 2011). This model is described below:

$$INVST_{i,t+1} = \beta_0 + \beta_1 * SaleGR_{i,t} + \beta_2 * NEG_{i,t} + \beta_3 * SaleGR_{i,t} * NEG_{i,t} + \varepsilon_{i,t+1} \quad (4)$$

where:

$$\varepsilon_{i,t+1} = INVSTEFF2_{i,t+1}$$

Previous research has recognized that the relation between investment and growth could differ depending upon whether sales increases or sales decreases (Elberly 1997). We follow Chen et al. (2011) and employ a piecewise linear regression model that allows for a differential predictability between sales increases and sales decreases. The variable $NEG_{i,t}$ is an indicator variable that takes the value of one if sales growth in period t is negative and the value of zero otherwise. All other variables that are included in the model are defined above. As with equation (3), equation (4) is estimated cross-sectionally, by the Fama and French (1997) industry categorization, for all year-industry groupings that contain at least 10 observations.[11]

### 4.2.3 Independent Variables

As stated in H1, firms that have FRQ issues (MW) are expected to experience a much greater investment inefficiency impact compared to firms that do not report such

[11] The average adjusted $R^2$ for the investment model presented by equation (3) is 9.8%. The average adjusted $R^2$ for the investment model presented by equation (4) is 11.2%. These results are comparable to those reported by McNichols and Stubben (2008) and Chen et al. (2011).

issues (MW). Additionally, we state in H2, H3, and H4 that firms that report FRQ issues (MW) in multiple consecutive years are expected to experience a much greater investment inefficiency impact compared to firms that report FRQ issues (MW) in only a single year. Accordingly, the key independent variables utilized within the current study are whether or not a firm has FRQ issues (MW) and the number of consecutive years (i.e., one, two, three and four or more) in which a firm reports these issues (MW).

Related to the above and following Gordon and Wilford (2012), we classify firms according to two different schemes. The first classification scheme is used within equation (1) and in the first scheme, my key independent variable is an indicator variable (*MW*) that is set equal to one if an observation reports FRQ issues within their financial reports, zero otherwise. This first classification scheme is used to test H1. If reporting FRQ issues in any particular year has an negative impact on investment efficiency, the coefficient tied to *MW* should be negative if the investment efficiency residual tied to the observation falls into the underinvestment category and positive if the investment efficiency residual tied to the observation falls into the overinvestment category.

The second classification scheme is used to examine the remaining hypotheses (H2, H3, and H4) and is tested using equation (2). The key independent variables in equation (2) represent the number of consecutive years FRQ issues are reported and are specified as four indicator variables. The first indicator variable, *MW1*, is equal to one for observations of FRQ issues associated with firms that have not previously reported FRQ issues (zero otherwise). The indicator variables for observations that report FRQ issues in two, three, and four or more consecutive years are *MW2*, *MW3*, and *MW4*, respectively. More specifically, a one is assigned to one of these variables in each observation of FRQ

issues dependent on whether the reporting of the issues within the observation represents a consecutive occurrence of FRQ issues in two, three, or more years.

If reporting FRQ issues in multiple consecutive years has a greater negative impact on investment efficiency than reporting FRQ issues in a single year, the coefficients tied to *MW2*, *MW3*, and *MW4* should be more negative (positive) if the investment efficiency residual tied to the observation falls into the underinvestment (overinvestment) category than the investment residual tied to the MW1 observations (H2). Also, if reporting FRQ issues in multiple consecutive years has a increasingly negative impact on investment efficiency, as the number of consecutive years in which MW are reported increases, the coefficients tied to *MW2*, *MW3*, and *MW4* should become increasingly more negative (positive) if the investment efficiency residual tied to the observation falls into the underinvestment (overinvestment) category (H3 and H4).

As additional independent variables, I include two different groups of control variables. The first group of variables is included to control for the determinants of firms that report FRQ issues (*MKT_CAP, AGE_FIRM, LOSS, FCR,* and *SL_GR)*. We include these variables to differentiate between the effects of FRQ issues (MW) and those of firm characteristics that are known to be significantly associated with reporting FRQ issues (MW). Our choice of these variables follows the methodology of Gordon and Wilford (2012). Prior research on the determinants of MW indicates that firms that are smaller, younger, financially weaker, more complex, and grow more rapidly are more likely to report MW (Doyle et al. 2007a; Ashbaugh-Skaife et al. 2008). Thus, we would expect that as firm size (*MKT_CAP*) and firm age (*AGE*_FIRM) increase, investment efficiency will also increase. *MKT_CAP* is defined as the logarithm of the market capitalization of

each observation and *AGE_FIRM* is defined as the logarithm of the number of years the firm has been reporting in the CRSP database.

By the same token, as the financial stability (*LOSS*) of a firm increases, firm complexity (*FCR*) decreases, and firm growth (*SL_GR*) decreases, we expect that investment efficiency will increase. *LOSS* is an indicator variable that is set equal to one if the sum of income before extraordinary items in years t and t-1 is less than zero, zero otherwise. *FCR* is defined as an indicator variable that is set equal to 1 if the firm reports a non-zero value for foreign currency translation, zero otherwise. *SL_GR* is defined as the decile ranking for year over year sales growth from years t-2 through t.

The second group of control variables has been used in the prior literature (Biddle et al. 2009; Cheng et al. 2011) to control for the determinants of investment level (*M2B, CF, SDCF, SDS, SDI, TNGBTY, KSTR, MKSTR, OPCY,* and *DVDS*). Biddle and Hillary (2006) find that *M2B, TNGBTY, KSTR, MKSTR, DVDS,* and *SDCF* are related to capital investment. More specifically, market-to-book (*M2B*) is included as an assessment of a firm's growth opportunities (Hovakimian and Hovakimian 2009). *M2B*, is measured as total assets plus market value of equity minus book value of equity minus deferred taxes, divided by total assets. Tangibility is included to account for the cost of bankruptcy and is a financial constraint measure (Biddle and Hillary 2006). *TNGBTY* is measured as property, plant and equipment divided by average total assets. K-structure and mean K-structure are measures of market leverage and are included as additional financial constraint measures (Biddle et al. 2009). *KSTR*, is a firm's K-structure and is measured as long-term debt divided by the sum of long-term debt and the market value of equity. *MKSTR,* is the average K-structure of firms with the same 3-digit SIC code. The payment

of dividends has been used to classify firms into different groupings based on financial constraints (Hovakimian and Hovakimian 2009). *DVDS* is an indicator variable set equal to one if dividends are paid, zero otherwise.

In addition to the controls for capital investment, I also include one measure of financial slack (*CF*), two measures of volatility related to sales*, SDS*, and investment, *SDI*, and a measure of the length of a firm's operating cycle, *OPCY*. *SDS* and *SDI* are included to ensure the results are not simply capturing the relation between the volatility of investment and over and underinvestment (Biddle et al. 2009). They are measured as the standard deviation of sales and investment for the time period of t-5 through t-1. The length of a firm's operating cycle is included to ensure that the changes in investment are not related to the different stages of a firm's business cycle (Biddle et al. 2009). *OPCY* is measured as the log of receivables divided by sales plus inventory divided by cost of goods sold. I then multiply this total by 360 to arrive at the value I use for the *OPCY* variable.

### 4.2.4 Sample Selection

The firms and observations included in this study are drawn from the Audit Analytics database. I draw my sample from all observations that include management internal control reports as a part of their annual financial reports in accordance with SOX Section 404(a) (39,593) during the time period of November 2004 (the effective date for reporting under Section 404) through May 2010 (fiscal year 2009). Table 4.1 summarizes the composition of the final sample of observations used in the current study. The initial total sample of 39,593 observations consists of 6,418 observations with MW and 33,175 observations without MW (Table 4.1).

Six screens are applied to the initial sample to arrive at the final sample used in the current study. First, duplicate observations are eliminated to ensure that each firm had at most only one observation included for any given year (i.e., in cases of restatements the last filing is retained). Second, observations associated with firms that reported MW in nonconsecutive years were eliminated. This elimination was implemented because such an approach allows me to clearly distinguish firms reporting MW in multiple consecutive years from firms that report MW in a single year (i.e., firms reporting MW in non-consecutive multiple years fall somewhere between these two extremes).[12] As a third category of elimination, I eliminate firms from the control sample that report MW in their Section 302 reports and subsequently do not report MW in their Section 404 reports. These firms are eliminated because of the potential residual effect of the Section 302 reporting.

Through a fourth elimination category, I eliminate firms that partially remediate their MW. These firms are a subset of firms that report MW in multiple consecutive years and are remediating some, but not all of their MW in subsequent years. Elimination of this subset ensures that the current study does not capture any investment efficiency benefits that may be associated with partial remediating, thereby diluting the impact, of FRQ issues (MW) on investment efficiency. Fifth, I eliminate financial firms because of the different nature of investment that is associated with these firms. This category of elimination is consistent with the prior literature (Biddle et al. 2009). Finally, all observations that do not have the Compustat data available to calculate the variables used

[12] For comparison purposes, however, we did consider firms that report MW in multiple non-consecutive years within our sample time period as an alternative to compare to the firms that report MW in a single year. The results of this analysis fall between the two extremes of reporting MW in a single year and reporting MW in multiple consecutive years

within the current study and discussed above are eliminated. Following these categories of elimination, the analyses in the current study are performed using a total of 21,497 observations and this total consists of 1,272 observations with MW and 20,225 observations without MW.[13] The 1,272 observations of firms with MW are further broken down by MW classification and these results indicate that 1002, 191, 58, and 21 of these observations are classified as *MW1, MW2, MW3,* and *MW4* observations, respectively (Table 4.1, Panel B).

Through H4, I investigate if investment efficiency is more significantly impacted by investment specific FRQ issues (MW) rather than other types of FRQ issues (MW). Audit Analytics categorizes MW by the accounts that are impacted by the MW. We define the MW as investment related if the type of MW reported is categorized by Audit Analytics into any of the following categories: (1) Capitalization of expenditure issues, (2) Depreciation, depletion, or amortization issues, or (3) PPE, intangible, or fixed asset (value/diminution) issues. After we perform this categorization, we find that 420 firms report investment specific FRQ issues (MW). These investment specific FRQ issues are each classified according to my scheme described above and the results of this classification indicate that 330, 66, and 24 of these observations are classified as *MW1, MW2,* and *MW3* observations, respectively. These results are reported in Panel B of Table 4.1.

[13] The significant decline in the number of observations is due mostly to the inclusion of non-accelerated filers in the initial sample. These firms are smaller, and Compustat data is not available for the majority of firms that fall into this category.

# Chapter 5 Investment Efficiency and Financial Reporting Quality: Empirical Results

## 5.1 Primary Empirical Results

### 5.1.1 Descriptive Statistics

Table 5.1 presents univariate statistics separately for observations that fall into the control category (firms that do not report FRQ issues) and observations that fall into the various FRQ issues categories (i.e., *MW1*, *MW2*, *MW3*, and *MW4*). Panel A presents the control group characteristics compared to the complete FRQ issues (*MW*) group characteristics. As a complete group, firms that report FRQ issues have a higher percentage of investment. Consistent with prior research, firms that report FRQ issues (*MW*) are smaller, younger, report losses more frequently, and report foreign income more frequently (Doyle et al. 2007a; Ashbaugh-Skaife et al. 2008; Gordon and Wilford 2012). Additionally, these firms have higher variability in their cash flows, sales and investment. Finally, firms that report FRQ issues are less likely to distribute dividends.

Panel B displays the descriptive statistics of the complete *MW* group and the *MW1* group. Panel C displays the descriptive statistics of the *MW1* group and the *MW2* group. Panel D displays the descriptive statistics of the *MW2* group and the *MW3* group. Finally, Panel E displays the descriptive statistics of the *MW3* group and the *MW4* group. As firms continue to report FRQ issues (MW) in multiple consecutive years, the percentage of investment decreases, firm size and age increase, and the percentage of firms reporting losses and the percentage of firms with foreign operations increase. These results are consistent with prior research (Gordon and Wilford 2012). The remaining

characteristics stay relatively consistent as firms continue to report these issues in multiple consecutive years.

Since the firm level investment could refer to either underinvestment or overinvestment, I examine investment efficiency broken down according to these two different categories. The results of this examination are included in Figure 5.1. Panel A presents the results of firms with negative investment residuals (underinvestment), Panel B presents the results of firms with positive investment residuals (overinvestment). Firms that are included in the underinvestment category report a higher level of underinvestment (more negative residuals) when they also report FRQ issues (MW). Additionally, as firms continue to report these issues in multiple consecutive years, the underinvestment residuals increase (Panel A). Firms that are included in the overinvestment category report a higher level of overinvestment (more positive residuals) when they also report FRQ issues (MW). As firms continue to report these issues in multiple consecutive years, the overinvestment residuals increase (Panel B).

### 5.1.2 Single Category Regression Analyses

Table 5.2 presents the OLS regression results for the test of H1 using equation (1).[14] Following the research design of Chen et al. (2011) we estimate equation (1) separately for firms that fall into the underinvestment and overinvestment categories. Estimating these categories separately allows us to investigate whether FRQ issues have an amplifying effect on both types of inefficiencies. Underinvestment residuals are used as the dependent variable in the first two columns and overinvestment residuals are used

[14] We test the Variance Inflation Factors for all variables in each regression and find that the maximum factor is less than 5 for each variable. The variance inflation factor quantifies the severity of multicollinearity in OLS regression analyses. It is a measure of how much the variance of an estimated regression coefficient increases due to collinearity.

as the dependent variable in the last two columns. Columns (1) and (3) display the regression results associated with using *INVSTEFF1* as the dependent variable. Columns (2) and (4) display the regression results associated with using *INVSTEFF2* as the dependent variable. The regression models have adjusted $R^2$s ranging from 15.6 percent to 43.8 percent, with higher explanatory power being attributed to the underinvestment models. This is due to the prevalence of underinvestment within our sample and is in line with prior research (Chen et al. 2011).

Over all four specifications of the equation (1) pooled regression analysis we reach the same conclusion, FRQ issues (MW) have a negative impact on investment efficiency. More specifically, we find that within underinvestment regressions (columns 1 and 2), the two estimated *MW* coefficients are both negative and significant at the 0.01 level. The two estimated *MW* coefficients are both positive and significant at the 0.01 and the 0.05 level for columns (3) and (4) in the overinvestment regressions. We see that these results are robust to the inclusion of both firm-level characteristics and industry fixed effects. The results associated with the control variables are consistent with our expectations and with prior research.

The results in Table 5.2 suggest that when firms report FRQ issues (MW), investment efficiency decreases, consistent with H1. These results imply that FRQ issues negatively impact management's ability to efficiently allocate funds to their investments.

### 5.1.3 Multiple Category Regression Analyses

Table 5.3 presents the OLS regression results for the tests of H2 and H3 using equation (2). Once again, following the research design of Chen et al. (2011) I estimate equation (2) separately for firms that fall into the underinvestment and overinvestment

categories. Columns 1 and 3 display the regression results associated with using *INVSTEFF1* as the dependent variable. Columns 2 and 4 display the regression results associated with using *INVSTEFF2* as the dependent variable. Underinvestment residuals are used as the dependent variable in the first two columns and overinvestment residuals are used as the dependent variable in the last two columns. These regression models have adjusted $R^2$s ranging from 16.6 percent to 44.9 percent, with higher explanatory power being attributed to the underinvestment models. We observe that breaking the FRQ issues variable (MW) down into different categories based on the number of years in which FRQ issues are reported increases the explanatory power of the models.

Over all four specifications of the equation (2) pooled regression analysis we reach the same conclusion, FRQ issues that are reported in multiple consecutive years have a greater negative impact on investment efficiency than FRQ issues that are reported in a single year. Additionally, the results indicate that as firms continue to report these in multiple consecutive years the negative impact on investment efficiency increases. More specifically, we find that within the underinvestment regressions displayed in columns 1 and 2, the four FRQ issues estimated coefficients are negative and significant in column 1 and three of the four coefficients are significant in column 2. Also, the investment inefficiency for underinvestment is increasing at an increasing rate as firms continue to report FRQ issues in multiple consecutive years. On the other hand, we find that within the overinvestment regressions displayed in columns 3 and 4 the FRQ issues estimated coefficients are positive and significant for all MW categories. The investment inefficiency for overinvestment is also increasing at an increasing rate as firms continue to report FRQ issues in multiple consecutive years. These results are robust to the

inclusion of both firm-level characteristics and industry fixed effects. The results associated with the control variables are consistent with our expectations and with prior research.

The results in Table 5.3 suggest that the negative impact on investment efficiency is larger as firms continue to report FRQ issues in multiple consecutive years, consistent with H2. Additionally, as firms continue to report FRQ issues in multiple consecutive years, investment efficiency will decrease at an increasing rate, consistent with H3. These results indicate that FRQ issues that are reported in multiple consecutive years have a much larger negative impact on a firm's FRQ and further hinder management's ability to efficiently allocate funds to their investments.

### 5.1.4 Investment Specific Regression Analyses

We present the investment specific FRQ issues OLS regression results for equation (2) in Table 5.4, columns 1, 3, 5, and 7. We compare the investment specific FRQ issues OLS regression results to results that arise from the OLS regression of equation (2) using all other types of FRQ issues (columns 2, 4, 6, and 8). Results for underinvestment are presented in columns 1, 2, 5, and 6. Results for overinvestment are presented in columns 3, 4, 7, and 8. The first four columns present the results using *INVSTEFF1* as the dependent variable and the last four columns present the results using *INVSTEFF2* as the dependent variable. These regression models have adjusted $R^2$s ranging from 15.5 percent to 45.9 percent, with higher explanatory power being attributed to the models that present only investment specific FRQ issues. Since the sample of investment specific issues does not include any MW4 observations, we have eliminated these observations from the other groups to facilitate comparability.

The results in Table 5.4 confirm the results presented in Tables 5.2 and 5.3, firms that report FRQ issues experience a decline in investment efficiency. This decline in investment efficiency is amplified as firms continue to report these FRQ issues in multiple consecutive years. The results in Table 5.4 add to the previous results. These results provide evidence that investment specific FRQ issues are driving the decline in investment efficiency. More specifically, we find that within column 1, the coefficients associated with FRQ issues categories are negative and significant at the 0.01 level for all MW variables when investment specific FRQ issues are used in the analysis. However, column 2 provides evidence that the coefficients that are associated with all other FRQ issues are not as significant. These results hold for all underinvestment and overinvestment comparisons.

The results in Table 5.4 suggest that the impact of FRQ issues on investment efficiency is most likely being driven by investment specific FRQ issues, consistent with H4. These results indicate that investment specific FRQ issues have a greater impact on the quality of the information that is used in making investment decisions.

Table 5.5 provides a summary of the results of the analyses that are discussed above. More specifically, Table 5.5 lists the hypotheses, the equations used to test those hypotheses, whether the hypotheses are confirmed, and the tables in which the results are listed.

## 5.2 Additional Analyses

### 5.2.1 Timing Differences

Moral hazard and adverse selection research recognizes that information asymmetry leads to underinvestment or overinvestment ex-post (Jensen 1986; Lambert et

al. 2007; Myers and Majluf 1984). The models (equations 1 and 2) used in the main analyses of this current study are based on models established and used in the prior literature that examines the relation between investment efficiency and FRQ with respect to moral hazard and adverse selection (Biddle et al. 2009; Chen et al. 2011). As such, the models in the current study examine the impact of FRQ on ex-post investment efficiency.

Although I recognize the arguments of the previous literature that model the FRQ investment efficiency relation as described above, the current study is seeking to examine how FRQ issues, proxied by MW, impact investment efficiency. These FRQ issues likely have a concurrent relation with investment efficiency because they may be adversely impacting the information that is used to make investment decisions in the current period. As such, this relation can also be examined contemporaneously. To do so, I re-examine equations 1 and 2 using the following model specifications:

$$\begin{aligned} INVSTEFFi_{i,t} = {} & \beta_0 + \beta_1 * MW_{i,t} + \beta_2 * MKT\_CAP_{i,t} + \beta_3 * AGE\_FIRM_{i,t} + \beta_4 * LOSS_{i,t} \\ & + \beta_5 * FCR_{i,t} + \beta_6 * SL\_GR_{i,t} + \beta_7 * M2B_{i,t} + \beta_8 * CF_{i,t} + \beta_9 * SDCF_{i,t} \\ & + \beta_{10} * SDS_{i,t} + \beta_{11} * SDI_{i,t} + \beta_{12} * TNGBTY_{i,t} + \beta_{13} * KSTR_{i,t} + \beta_{14} * MKSTR_{i,t} \\ & + \beta_{15} * OPCY_{i,t} + \beta_{16} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (5)$$

$$\begin{aligned} INVSTEFFi_{i,t} = {} & \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} + \beta_5 * MKT\_CAP_{i,t} \\ & + \beta_6 * AGE\_FIRM_{i,t} + \beta_7 * LOSS_{i,t} + \beta_8 * FCR_{i,t} + \beta_9 * SL\_GR_{i,t} + \beta_{10} * M2B_{i,t} \\ & + \beta_{11} * CF_{i,t} + \beta_{12} * SDCF_{i,t} + \beta_{13} * SDS_{i,t} + \beta_{14} * SDI_{i,t} + \beta_{15} * TNGBTY_{i,t} \\ & + \beta_{16} * KSTR_{i,t} + \beta_{17} * MKSTR_{i,t} + \beta_{18} * OPCY_{i,t} + \beta_{19} * DVDS_{i,t} \\ & + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (6)$$

Allowing for the above contemporaneous examination of the FRQ – investment efficiency relation, permits me to expand the sample to include FRQ issues that are reported in fiscal year 2010. The results from this analysis remain robust to the results of the main analysis (i.e., all four hypotheses are confirmed). Due to the similarities between the main analysis results and the results cited in the current section, the results remain untabulated.

### 5.2.2 Replication of Previous Research

Because of the similar focus of the current study to the Biddle et al. (2009) and Cheng et al. (2011) studies, I replicate these two previous studies using the current study's sample data to ensure that the results described above are not the result of differences in the samples of the prior studies. Additionally, I replicate these studies to prove that my results are robust to the implications of the previous studies.

#### 5.2.2.1 Biddle et al. (2009) Replication

Biddle et al. (2009) use a conditional regression model and a multinomial logit model to predict the likelihood that a firm will either overinvest or underinvest. My remarks in this section focus upon the multinomial logit model because of the overlap between the Biddle et al. (2009) and Cheng et al. (2011) models. The conditional model will be the focus of the Cheng et al. (2011) replication in the next section.

The Biddle et al. (2009) results using a multinomial logit model indicate that firms with higher FRQ, proxied by accruals quality, will make more efficient investments (Biddle et al. 2009). Within their model, they sort the firms yearly based on the residuals that are obtained from equation (3). These residuals are then formed into quartiles (*INVSTQ*). The bottom quartile (most negative residuals) represents underinvestment, the middle two quartiles represent the base group, and the upper quartile (most positive residuals) represents overinvestment. Within this study, Biddle et al. (2009) use many of the same control variables that we employ in the current study and the model that is used to present this multinomial logistic regression is presented below as equation (5). All variables listed below are defined in Appendix A.

$$INVSTQ_{i,t+1} = \beta_0 + \beta_1 * AQ_{i,t} + \beta_2 * INSTIT_{i,t} + \beta_3 * ANLYT_{i,t} + \beta_4 * IG\_SCORE_{i,t} + \beta_5 * DG\_SCORE_{i,t} + \beta_6 * LGASST_{i,t} + \beta_7 * M2B_{i,t} + \beta_8 * SDCF_{i,t} + \beta_9 * SDS_{i,t} + \beta_{10} * SDI_{i,t} + \beta_{11} * Z\_SC_{i,t} + \beta_{12} * TNGBTY_{i,t} + \beta_{13} * KSTR_{i,t} + \beta_{14} * MKSTR_{i,t} + \beta_{15} * CF_{i,t} + \beta_{16} * DVDS_{i,t} + \beta_{17} * AGE\_FIRM_{i,t} + \beta_{18} * OPCY_{i,t} + \beta_{19} * LOSS_{i,t} \quad (5)$$

The results obtained through my replication of Biddle et al. (2009) are displayed as Table 5.6. The results of the underinvestment quartile compared to the base case are displayed in columns 1 and 2. The results of the overinvestment quartile compared to the base case are displayed in columns 3 and 4. My replication results mirror those of Biddle et al. (2009). I find that for the time period of November 2004 through May 2010, firms that have higher FRQ (AQ) will exhibit greater investment efficiency. The similarity of the results that I obtain through my replication imply that FRQ, whether calculated as the presence of issues with MW or as accruals quality has an impact on firm investment efficiency.

#### 5.2.2.2 Cheng et al. (2011) Replication

Rather than model investment efficiency as a deviation from expected investment, Cheng et al. (2011) follow Biddle et al. (2009) and use a conditional model to determine whether FRQ, proxied by reported MW, acts as a signal and curbs inefficient investments. Two different models are used to examine their hypotheses. These models are displayed below as equations (6) and (7).

$$INVST_{i,t} = \beta_0 + \beta_1 * MWFIRM_{i,t-1} + \beta_2 * MWFIRM_{i,t-1} * IE_{i,t} + \sum \alpha_i * MWFIRMDet_{i,t-1} + \sum \gamma_i * INVDet_{i,t-1} + \sum \delta_i * GOV_{i,t-1} + \sum \delta_i * GOV_{i,t-1} * IE_{i,t} \quad (6)$$

$$INVST_i = \beta_0 + \beta_1 * MWFIRM_{i,t-1} + \beta_2 * MWFIRM_{i,t-1} * IE_{i,t} + \beta_3 * MWFIRM_{i,t+1} + \beta_4 * MWFIRM_{i,t+1} * IE_{i,t+2} + \beta_5 * MWFIRM_{i,t+2} + \beta_6 * MWFIRM_{i,t+2} * IE_{i,t+3} + \sum \alpha_i * MWFIRMDet_i + \sum \gamma_i * INVDet_i + \sum \delta_i * GOV_i + \sum \delta_i * GOV_i * IE_i \quad (7)$$

Equation (6) is used to examine whether firms that report MW and are financially constrained are more likely to underinvest and overinvest. Equation (7) is used to

examine whether investment inefficiencies are reduced in the years following disclosure of MW. I employ the same methodology followed by Cheng et al. (2011) and replicate their study using my sample that draws observations from November 2004 through May 2010. All variables listed in the equations above are defined in Appendix A. The results of my replication are displayed in Table 5.7. Column 1 of Table 5.7 displays my results using equation (6) and column 2 displays my results using equation (7).

The main results of the equation (6) replication lie in the coefficients that are attached to the *MWFIRM* variable and the *MWFIRM*IE* interaction. *IE* is obtained by taking an average of the decile rankings of firm cash balances and leverage.[15] This average is then scaled to a range between zero and one. An *IE* close to zero is indicative of a firm that is financially constrained and would be a potential indicator of an increased likelihood of underinvesting. *MWFIRM* is an indicator variable that is set equal to 1 if the firm reports MW in year t.

The results of my replication of equation (6) in Table 5.7, column 1, indicate that as *IE* draws closer to a value of one, the likelihood of over-investment increases. More specifically, firms that report MW and have low cash balances coupled with high levels of leverage (financially constrained firms) are associated with underinvestment (indicated through a negative and significant coefficient attached to $\beta_1$). On the other hand, firms that report MW and have high cash balances coupled with low levels of leverage (financially unconstrained firms) are more likely to overinvest (indicated through a positive and significant coefficient attached to ($\beta_1+\beta_3$).

The main results of the Cheng et al. (2011) equation (7) replication lie in the coefficients that are attached to the *MWFIRM* variables and the *MWFIRM*IE*

[15] Leverage is multiplied by negative one so that it can be directly related to the cash balances decile.

interactions. The results of our replication in Table 5.7, column 3, indicate that firms that report MW with low cash balances coupled with high levels of leverage (financially constrained firms) are associated with underinvestment in years t+1 and t-1. On the other hand, firms that report MW and have high cash balances coupled with low levels of leverage (financially unconstrained firms) are more likely to overinvest in year t-1 only. Cheng et al. (2011) conclude, from these results, that disclosure produces an increase in investment efficiency.

### 5.2.3 The Role of Remediation in Increasing Investment Efficiency

Whereas Cheng et al. (2011) argue that disclosure increases investment efficiency, the current study argues that it is remediation of FRQ issues (MW) that increases investment efficiency. Further data analysis is required to investigate why the results of the current study reveal that firms continue to invest inefficiently and to an increasing degree after first reporting FRQ issues. The Cheng et al. (2011) results indicate that firms invest more efficiently following disclosure of FRQ issues. A high level analysis of the firms that report these issues indicates that of the firms that report FRQ issues in year t, roughly 50 percent have remediated these issues by year t+1. Additionally, roughly 50 percent of firms that continue report FRQ issues in year t+1 remediate these issues by year t+2.

To examine the relation between the Cheng et al. (2011) results and my results I remove the firms that remediate MW from the Cheng et al. (2011) sample and rerun the equation (7) regression analyses. In these untabulated results I find that firms that continue to report FRQ issues in multiple consecutive years experience an increase in their investment inefficiency in support of this study's main argument. More specifically,

these results indicate the underinvestment and overinvestment are significantly present in years t+1 and t+2.

To provide robustness to my results, I also adapted this conditional analysis to investigate the FRQ – investment efficiency relation in the context of remediation. I integrate the conditional tests that are used in both Biddle et al. (2009) and Cheng et al. (2011) to examine the conditional impact that reporting FRQ issues (MW) in multiple consecutive years may have on investment. The model that I use to examine this conditional impact is displayed below as equation (8).

$$\begin{aligned} INVST_{i,t+1} = {} & \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} + \beta_5 * IE_{i,t+1} \\ & + \beta_6 * MW1_{i,t} * IE_{i,t+1} + \beta_7 * MW2_{i,t} * IE_{i,t+1} + \beta_8 * MW3_{i,t} * IE_{i,t+1} \\ & + \beta_9 * MW4_{i,t} * IE_{i,t+1} + \beta_{10} * MKT\_CAP_{i,t} + \beta_{11} * AGE\_FIRM_{i,t} + \beta_{12} * LOSS_{i,t} \\ & + \beta_{13} * FCR_{i,t} + \beta_{14} * SL\_GR_{i,t} + \beta_{15} * M2B_{i,t} + \beta_{16} * CF_{i,t} + \beta_{17} * SDCF_{i,t} \\ & + \beta_{18} * SDS_{i,t} + \beta_{19} * SDI_{i,t} + \beta_{20} * TNGBTY_{i,t} + \beta_{21} * KSTR_{i,t} \\ & + \beta_{22} * MKSTR_{i,t} + \beta_{23} * OPCY_{i,t} + \beta_{24} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (8)$$

Using the model displayed as equation (8) above, I perform an OLS regression and the results are displayed as Table 5.8. These results indicate that firms that report FRQ issues (MW) tend to underinvest compared to firms that do not report FRQ issues (MW) ($\beta_1<0, \beta_2<0, \beta_3<0, \beta_4<0$). Also, firms that report FRQ issues (MW), have low levels of cash, and have high levels of leverage tend to underinvest to a greater degree as they continue to report FRQ issues (MW) in multiple consecutive years. The results also indicate that firms that report FRQ issues (MW), have high levels of cash, and have low levels of leverage tend to overinvest compared to firms that do not report FRQ issues (MW) ($\beta_1+\beta_6>0, \beta_2+\beta_7>0, \beta_3+\beta_8>0, \beta_4+\beta_9>0$). Additionally, firms that report FRQ issues (MW) overinvest to a greater degree as they continue to report FRQ issues (MW) in multiple consecutive years.

### 5.2.4 Change Analysis

The main analyses measure the *INVSTEFF1* and *INVSTEFF2* variables (i.e., the dependent variables) in terms of the level of the residuals. However, to provide additional robustness to the results, I recomputed equation (2) with the *INVSTEFF1* and *INVSTEFF2* variables measured in terms of changes in *INVSTEFF1* and *INVSTEFF2*. Given the possibility that other events and firm factors could concurrently affect investment, the results using a change measure of the investment residuals provide additional support to the main results concerning the relation between FRQ issues and investment efficiency, as well as the negative relation between reporting such issues in multiple consecutive years and investment efficiency. I calculate the change in investment efficiency for each year t observation as the difference between the investment efficiency residuals in year t and year t-1.

By substituting a change in investment inefficiency variable in for the levels variable of investment inefficiency in the analysis, I can control for firm-specific omitted variables. The change in investment inefficiency model translates into a first difference model and is equivalent in its estimation to a fixed effects model (Wooldridge 2002). By subtracting $INVSTEFF_t$ from $INVSTEFF_{t+1}$, the fixed effects are cancelled out and the omitted variable bias is mitigated (Gordon et al. 2010).

Based on this change measure of CE, I recomputed the equation (2) OLS regression analyses to assess whether the results remain robust to this new measure of the dependent variable. The findings show that the previous results are robust when we measure investment efficiency as a change variable. More specifically, as shown in Table 5.9, the results indicate that FRQ issues (MW) are associated with an increase in

investment inefficiency that intensifies as a firm continues to report these issues in consecutive years.

### 5.2.5 Additional Control Variables

Prior research in this area has utilized additional variables that control for FRQ, proxied by accruals quality, and various governance variables (Biddle et al. 2009; Cheng et al. 2011). To ensure that my measure of FRQ (MW) is not capturing aspects of FRQ that have previously been investigated, I include these additional variables. Equation (9), below, models the OLS regression analysis that includes the additional control variables.

$$\begin{aligned} INVSTEFFi_{i,t+1} = {} & \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} \\ & + \beta_5 * AQ_{i,t} + \beta_6 * INSTIT_{i,t} + \beta_7 * ANLYT_{i,t} + \beta_8 * IG\_SCORE_{i,t} \\ & + \beta_9 * DG\_SCORE_{i,t} + \beta_{10} * MKT\_CAP_{i,t} + \beta_{11} * AGE\_FIRM_{i,t} + \beta_{12} * LOSS_{i,t} \\ & + \beta_{13} * FCR_{i,t} + \beta_{14} * SL\_GR_{i,t} + \beta_{15} * M2B_{i,t} + \beta_{16} * CF_{i,t} + \beta_{17} * SDCF_{i,t} \\ & + \beta_{18} * SDS_{i,t} + \beta_{19} * SDI_{i,t} + \beta_{20} * TNGBTY_{i,t} + \beta_{21} * KSTR_{i,t} \\ & + \beta_{22} * MKSTR_{i,t} + \beta_{23} * OPCY_{i,t} + \beta_{24} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (9)$$

All variables listed in equation (9) are defined within Appendix A. *AQ* is the modified Dechow and Dichev (2002) measure of accruals quality (McNichols 2002). Including *AQ* helps to account for any differences that may exist between FRQ related to earnings and FRQ related to internal control. The remaining four additional variables are corporate governance variables that could also have a potential impact on investment efficiency. Four different measures of corporate governance are included because they each play a different role in monitoring and governance. *INSTIT* is included to represent institutional shareholders, *ANALYT* is included to represent analyst following, and *IG_SCORE* is included to account for a composite of other corporate governance factors. Because there are only a limited number of firms that have a calculated governance index (*IG_SCORE*), I also include *DG_SCORE,* a dummy variable that indicates whether or not the *IG_SCORE* is available for a particular firm (Biddle et al. 2009).

The results of the OLS regression that uses equation (9) are displayed within Table 5.10. The results indicate that even when additional variables to control for FRQ and corporate governance are included, the results are robust to this alternative specification. These results imply that MW as a measure of FRQ provides information about investment efficiency above and beyond the information that is provided through measures of earnings quality and corporate governance.

## 5.3 Implications and Conclusion

The new financial reporting requirements associated with SOX have defined internal control as internal control over financial reporting. Since firms are now required to report on this category of internal control, FRQ can be directly tied to the status of a firm's internal control reports. Recently, accounting researchers have examined the relation between FRQ and investments (Biddle and Hillary 2006; Biddle et al. 2009; Chen et al. 2011; Cheng et al. 2011). Additionally, Lambert et al. (2007) indicate that FRQ has an impact on real investment decisions at the firm level.

The current study uses MW as a proxy for FRQ (Cheng et al. 2011; Costello and Wittenberg-Moerman 2011) and examines the relation between this new measure of FRQ and investment efficiency. Building on the research of Gordon and Wilford (2012), the current study examines the impact of poor FRQ in multiple consecutive years on investment efficiency. Additionally, I examine whether MW that are specifically related to investment have a more significant impact on investment efficiency

My findings provide evidence that MW, as a proxy for FRQ, have a negative impact on investment efficiency. More specifically, the current study shows that investment inefficiency increases as the number of consecutive years in which the firm

reports FRQ issues (MW) increases. Additionally, the results indicate that investment inefficiencies are being driven by investment specific FRQ issues (MW). Prior research has used accruals quality as a proxy for FRQ (McNichols and Stubben 2008; Biddle et al. 2009). The results from the current study are robust to alternative model specifications, a change in investment efficiency specification and the inclusion of additional control and governance variables in our equation (2) analyses.

My results have many implications, the following two of which seem most notable. First these results imply that MW, as a proxy for FRQ, provides FRQ information above and beyond that provided by the earnings quality measures that have been used in the prior literature. Second, my results imply that the remediation of investment specific FRQ issues (MW) will have a greater impact on improving investment efficiency than remediation of other types of FRQ issues (MW).

# Chapter 6 Summary and Discussion

This dissertation explores the historical context and literature surrounding internal control regulation and then presents studies that are tied to a primary objective and a secondary objective.

Chapter 2 sheds light on the historical context of the current internal control regulatory environment. Additionally, Chapter 2 provides a high level overview of the research that has resulted from the firm specific internal control data that is now available within the quarterly reports (Section 302 of SOX) and the annual reports (Section 404 of SOX). The research related to SOX and internal control spans several different accounting research areas (i.e., financial accounting, managerial accounting, auditing, etc.). Of the limitations attached to the review presented in Chapter 2, the following two seem most relevant. First, the research presented provides a brief overview rather than additional insight into the literature. Future examinations of this literature could develop a framework that helps to weave together the different results and insights. Second, because of the breadth of literature that is discussed, a deep analysis of particular internal control literature topics is not feasible. Future reviews of this literature may select a couple of the topics that were reviewed above and provide a more in-depth analysis.

Chapters 3, 4, and 5 investigate the primary objective of the current study, to re-examine and substantially extend the MW-investment inefficiency relation. This study uses the presence or absence of reported MW as a proxy for FRQ. Using a sample of firms that filed internal control reports from November 2004 through May 2010, I examine the relation between firms that report FRQ issues and investment inefficiency. I

measure investment inefficiency as the deviation from expected investment, where expected investment is measured as a function of sales growth. Investment inefficiency presents itself as either underinvestment (negative deviations) or overinvestment (positive deviations). My results indicate that FRQ issues (MW) are linked to investment inefficiency. Additionally, I examine and find evidence to support my hypothesis that FRQ issues (MW) in multiple consecutive years impact investment inefficiency to a greater degree. Furthermore, as a firm continues to report FRQ issues the degree of investment inefficiency will continue to increase. These results imply that FRQ issues negatively impact the information used to make real investment decisions. I also examine and find evidence to support my hypothesis that investment inefficiencies are being driven by investment specific FRQ issues. The results of this study are robust to specifying investment inefficiency as a change variable, including additional control variables, and analyzing investment inefficiency through a conditional model.

There are limitations associated with all empirical studies; however, the following two seem to be most notable. First, the implications of the residual measure of investment efficiency are unclear. The fit of the model that estimates investment efficiency is quite low (10%). Additionally as a result of issues related to the fit of the investment estimation model, each firm in the sample suffers from investment inefficiency to some degree. Future research could examine the significance of the residuals to ensure that the investment inefficiency that is being associated with my measure of investment inefficiency is significantly different than zero. Also, it would be helpful to derive a statistically significant estimate of the optimal investment level. Second, agency concerns are not considered in this study. Even though previous studies that have examined

investment efficiency have focused on agency concerns, the agency implications tied to having FRQ issues in multiple consecutive years should be considered.

The above limitations notwithstanding, the research provided above offers valuable insight that expands our knowledge of the role of internal control and negative consequences that can be linked to reporting specific types of MW. This study confirms the theoretical argument posited by Lambert et al. (2007) that FRQ impacts real investment decisions.

**Table 2.1**
**Internal Control Legislation: Cross-country Comparison[+]**

| Country | | | Canada | France | Japan | United Kingdom | United States |
|---|---|---|---|---|---|---|---|
| Internal Control Requirements | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mandatory Compliance | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Legislation | | | Bill 198; MI 52-109; NI 52-109 | Code of Commerce | Financial Instruments and Exchange Law | Combined Code | Sarbanes-Oxley Act |
| Scope of legislation | Internal Control | Operations | ✗ | ✓ | ✗ | ✓ | ✗ |
| | | Financial Reporting | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Compliance | ✗ | ✗ | ✗ | ✓ | ✗ |
| | Management of Internal Control | Identify and evaluate | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Respond | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Conclude on effectiveness | ✓ | ✗ | ✓ | ✓ | ✓ |
| | Disclose | Overall process | ✗ | ✓ | ✓ | ✓ | ✗ |
| | | Management of specific risks | ✗ | ✓ | ✓ | ✗ | ✗ |
| | | Effectiveness conclusion | ✓ | ✗ | ✓ | ✗ | ✓ |
| | | IT Response | ✗ | ✗ | ✓ | ✗ | ✗ |
| Framework | | | COSO, CoCo, Turnbull | ✗ | COSO | Turnbull | COSO, CoCo, Turnbull |
| External Auditor Involvement | | | ✗ | ✓ external report | ✓ external report | ✓ external exception reporting | ✓ external reporting |
| Principle vs. Rule Based | | | Rules-based moving to principles based | Rules-based | Rules-based | Principles-Based | Rules-based |

[+]Adapted from FEE (2005), Appendix III

**Table 2.2**
**Summary of the Internal Control Literature Post-SOX**

| Literature Sub-Section | Topic | Key Points | Authors |
|---|---|---|---|
| **2.4.1** | **Determinants of Internal Control** | Firms with MW are smaller, more complex, less profitable | Ge and McVay (2005) |
| | | Firms with MW are younger, have higher rates of growth and have undergone restructuring | Doyle et al. (2007a) |
| | | Results driven by entity-level MW | |
| | | Firms with MW have fewer resources to devote to internal control | Ashbaugh-Skaife et al. (2007) |
| | | Firms with MW face greater control risk | |
| **2.4.2** | **Financial Reporting Quality and Internal Control** | Firms with MW have lower earnings quality | Ashbaugh-Skaife et al. (2008); Doyle et al. (2007b) |
| | | There is a positive relation between firms with MW and earnings management | Chan et al. (2008) |
| | | Firms with strong internal control have a higher level of financial reporting quality | Nagy (2010) |
| | | Inaccurate data caused by MW leads to inaccurate management guidance | Feng et al. (2009) |
| | | There is a positive relation between conservatism and internal control quality | Goh and Li (2011) |
| | | MW have been used as a proxy for financial reporting quality | (Cheng et al. (2011); Costello and Wittenberg-Moerman (2011) |

*Table 2.2 Cont.*

| | | | |
|---|---|---|---|
| **2.4.3** | **Firm Performance and Internal Control** | There is a negative stock price reaction to MW disclosure | Hammersley et al. (2008); Kim and Park (2009) |
| | | Reporting Section 302 MW leads to negative abnormal returns; Reporting Section 404 MW does not | Beneish et al. (2008) |
| | | Larger firms do not experience as large of a negative reaction to MW | |
| | | Theoretical evidence that MW increase a firm's cost of equity | Lambert et al. (2007) |
| | | Cost of equity is not significantly higher for firms that report Section 404 MW | Ogneva et al. (2007); Beneish et al. (2008) |
| | | Cost of equity is significantly higher for firms that report Section 302 MW | Beneish et al. (2008) |
| | | Significant increase in cost of equity for firms that report MW | Ashbaugh-Skaife et al. (2009); Gordon and Wilford (2012) |
| | | Reconcile mixed cost of equity results | Gordon and Wilford (2012) |
| | | Remediation of MW leads to a decrease in cost of equity | Gordon and Wilford (2012) |
| | | Firms that report MW have an increased cost of debt | Dhaliwal et al. (2011) |
| | | Banks charge higher interest rates to firms with MW | Kim et al. (2011) |
| **2.4.4** | **Audit Fees and Internal Control** | Firms that report MW have higher audit fees | Raghunandan and Rama (2006); Hoitash et al. (2008) |
| | | Firms that report MW are more likely to dismiss their auditor | Ettredge et al. (2007) |
| | | Firms that pay higher audit fees are more likely to dismiss their auditor post-SOX | |
| | | More severe MW are linked to higher audit fees and higher risk | Hogan and Wilkins (2008) |
| | | The relation between audit fees and financial reporting risk increased post SOX | Charles et al. (2010) |
| | | Firms that remediate their MW have lower audit fees than those that do not | Munsif et al. (2011); Hoag and Hollingsworth (2011) |
| | | Audit fee premiums continue to be paid for 2 years following remediation | |
| | | Audit costs can be reduced for small firms at no loss to quality by dismissing the SOX 404(b) audit requirement | Kinney and Shepardson (2011) |

*Table 2.2 Cont.*

| | | | |
|---|---|---|---|
| **2.4.5** | **The Auditor/Firm Relationship and Internal Control** | Initial clients post-SOX experience audit fee premiums | Huang et al. (2009) |
| | | MW are the most significant factor associated with auditor dismissals | Ettredge et al. (2011) |
| | | Auditor changes post-SOX are a function of capacity constraints | Landsman et al. (2009) |
| **2.4.6** | **The Audit Committee and Internal Control** | Firms that appoint accounting financial experts to the audit committee experience a positive market reaction | Defond et al. (2005); Hoitash et al. (2009) |
| | | Accounting financial experts impact the effectiveness of internal control | |
| | | Firms that appoint former audit partners to their audit committee are less likely to report MW | Naiker and Sharma (2009) |
| | | There is a positive relation between earnings quality and the social ties of board members | Krishnan et al. (2011) |
| | | Independent audit committees with a financial expert are less likely to report MW (pre-SOX) | Krishnan (2005) |
| | | Individuals with greater internal control experience are appointed to audit committees post-SOX | Beasley (2009) |
| | | Audit committee compensation is positively linked to the demand for monitoring | Engel et al. (2010) |
| **2.4.7** | **Economic Consequences of SOX** | Firms impacted by SOX experience negative abnormal returns around SOX related legislative events | Zhang (2007) |
| | | The number of firms that file for deregistration post-SOX has increased | Leuz et al. (2007) |
| | | SOX compliance costs have driven the increase in the number of going private decisions by firms | Engel et al. (2007) |
| | | Large foreign firms will continue to list on the U.S. stock exchanges; Small foreign firms are more likely to list on the U.K. stock exchange | Piotroski and Srinivasan (2008) |
| | | Non-accelerated filers have incentives to remain small post-SOX | Gao et al. (2009) |
| | | Theoretical evidence that SOX improves internal control by reducing the incidence of fraud | Patterson and Smith (2007) |
| | | In the long run audit costs will decrease and audit efficiency with increase in the post-SOX environment | |
| | | Auditors detect ¾ of report MW, supporting the vital role of Section 404(b) | Bedard and Graham (2011) |

*Table 2.2 Cont.*

| | | | |
|---|---|---|---|
| **2.4.7** | **Economic Consequences of SOX – Cont.** | Smaller firms disclosing MW under SOX 404(a) at a comparable rate to larger firms | Kinney and Shepardson (2011) |
| | | Corporate risk-taking has declined post-SOX | Bargeron et al. (2010) |
| | | Option backdating has declined post-SOX | Dhaliwal et al. (2009) |
| | | Opportunities for strategic accrual manipulation have declined post-SOX | Comprix and Muller (2011) |
| | | Information security activities receive more attention post-SOX | Gordon et al. (2006) |
| **2.4.8** | **The Relation Between Corporate Governance and MW under SOX** | Higher levels of corporate governance quality reduce the likelihood of MW | Hoitash et al. (2009) |
| | | Types of MW reported vary depending on the experiences of the members of the board of directors | |
| | | External auditors indicate that positive changes in the board of directors, audit committee, and control environment are a part of the post-SOX environment | Cohen et al. (2010) |
| | | There is a positive relation between timely remediation of MW and larger audit committees, more independent boards, and greater non-accounting financial expertise | Goh (2009) |
| | | Firms that report MW are more likely to have a CFO with less experience | Li et al. (2010) |
| | | CFOs in firms with poor internal control receive lower compensation and have higher turnover rates | Wang (2010); Johnstone et al. (2011) |
| | | Remediation of MW is positively linked to increases in audit committee turnover and increases in the proportion of independent board members | Johnstone et al. (2011) |
| **2.4.9** | **Information Technology and Internal Control** | Internal control monitoring technology reduces the likelihood of MW | Masli et al. (2010) |
| | | Firms that report IT-related MW report a higher number of MW overall | Klamm and Watson (2009) |
| | | Implemented IT controls vary based on size, industry and status (public vs. private) | Wallace (2011) |
| | | Firms with ERP systems are less likely to report MW | Morris (2011) |
| | | Need for more research on technologies that will alleviate internal control burden faced by small firms | Arnold et al. (2007) |
| | | SOX has driven the change in auditor analytical procedure practices | Trompeter and Wright (2010) |

*Table 2.2 Cont.*

| | | | |
|---|---|---|---|
| **2.4.10** | **Shareholders and Internal Control** | Shareholders hold auditor partly responsible if they report account-level MW with restatements | Hermanson et al. (2009) |
| | | Shareholders lobbied for a stricter implementation of SOX | Hochberg et al. (2009) |
| | | Firms with high agency costs and limited legal repercussions have stronger internal control | Cassar and Garakos (2010) |
| | | Manager profit is positively linked to strong internal control | |
| | | Investors adjust investment risk assessments based on MW pervasiveness and disclosure | Rose et al. (2010) |
| | | Decline in bondholder value linked to SOX events | DeFond et al. (2011) |

## Table 4.1
## Sample Selection and Categorization of Firms with MW

| **Panel A: Sample Selection**[+] | |
|---|---|
| **MW Sample (Observations with MW):** | |
| Total number of Section 404 reports with MW for fiscal years 2004-2009 | 6,418 |
| Eliminate duplicates due to financial restatements | (159) |
| Eliminate observations arising from reporting MW in non-consecutive years | (488) |
| Eliminate observations associated with partial remediation | (1,074) |
| Eliminate firm years due to data restrictions imposed by the current study | (3,425) |
| Total number of observations identified for use in the current study | 1,272 |
| Control Sample (Observations with no MW) | |
| Total number of Section 404 reports without MW for fiscal years 2004-2009 | 33,175 |
| Eliminate duplicates due to financial restatements | (540) |
| Eliminate observations associated with firms reporting MW in SOX Section 302 reports and subsequently reporting clean SOX Section 404 reports | (729) |
| Eliminate observations arising from reporting MW in non-consecutive years | (431) |
| Eliminate observations associated with partial remediation | (393) |
| Eliminate firm years due to data restrictions imposed by the current study | (10,857) |
| Total number of control observations identified for use in the current study | 20,225 |
| **Total Sample** | **21,497** |
| **Panel B: Categorization of MW**[++] | |
| Observations associated with firms reporting MW: | |
| Single year | 1,002 |
| Two consecutive years | 191 |
| Three consecutive years | 58 |
| Four or more consecutive years[+++] | 21 |
| Total MW Observations | 1,272 |
| Observations associated with firms reporting capital investment specific MW: | |
| Single year | 330 |
| Two consecutive years | 66 |
| Three consecutive years | 24 |
| Total Capital Investment Specific MW Observations | 420 |

[+] Panel A defines the steps employed to arrive at the final MW and control samples for firms that report on their internal control during fiscal years 2004 through 2009.

[++] Panel B categorizes firms based on the number of consecutive years in which a firm reports MW. For example, if a firm reported MW in the previous two years (observations) and the current year, the reported MW for the firm in the current year would classify the observation as a three consecutive year observation. This firm's observation from the previous year would be classified as a two consecutive year observation and so on.

[+++] As discussed in the text, a limited number of firms had MW in five and six consecutive years. Given the limited number of observations available in the final sample, MW beyond four years were not considered as separate categories.

## Table 5.1
## Descriptive Statistics

**Panel A: Control Group Characteristics compared to MW Group Characteristics**

| | Control Group | | | MW Group | | |
|---|---|---|---|---|---|---|
| **Variable** | **Obs.** | **Mean** | **Std. Dev.** | **Obs.** | **Mean** | **Std. Dev.** |
| INVST | 20,225 | 12.57 | 17.89 | 1,272 | 13.42 | 19.00 |
| MKT_CAP | 20,225 | 4240.51 | 12129.77 | 1,272 | 1565.51 | 6623.28 |
| AGE_FIRM | 20,225 | 16.34 | 15.59 | 1,272 | 13.40 | 13.02 |
| LOSS | 20,225 | 0.28 | 0.45 | 1,272 | 0.47 | 0.50 |
| FCR | 20,225 | 0.27 | 0.44 | 1,272 | 0.31 | 0.46 |
| SL_GR | 20,225 | 5.56 | 2.79 | 1,272 | 5.50 | 3.08 |
| M2B | 20,225 | 1.85 | 1.46 | 1,272 | 1.87 | 1.49 |
| CF | 20,225 | -0.25 | 2.62 | 1,272 | -0.38 | 2.74 |
| SDCF | 20,225 | 0.06 | 0.07 | 1,272 | 0.08 | 0.08 |
| SDS | 20,225 | 0.13 | 0.14 | 1,272 | 0.17 | 0.16 |
| SDI | 20,225 | 8.08 | 12.43 | 1,272 | 10.06 | 13.47 |
| TNGBTY | 20,225 | 0.22 | 0.25 | 1,272 | 0.22 | 0.23 |
| KSTR | 20,225 | 0.21 | 0.24 | 1,272 | 0.20 | 0.24 |
| MKSTR | 20,225 | 0.21 | 0.14 | 1,272 | 0.18 | 0.13 |
| OPCY | 20,225 | 5.04 | 1.50 | 1,272 | 4.97 | 1.33 |
| DVDS | 20,225 | 0.35 | 0.48 | 1,272 | 0.12 | 0.32 |

**Panel B: MW Group Characteristics compared to MW1 Group Characteristics**

| | MW Group | | | MW1 Group | | |
|---|---|---|---|---|---|---|
| **Variable** | **Obs.** | **Mean** | **Std. Dev.** | **Obs.** | **Mean** | **Std. Dev.** |
| INVST | 1,272 | 13.42 | 19.00 | 1,002 | 14.47 | 20.48 |
| MKT_CAP | 1,272 | 1565.51 | 6623.28 | 1,002 | 1466.33 | 5654.06 |
| AGE_FIRM | 1,272 | 13.40 | 13.02 | 1,002 | 12.91 | 13.08 |
| LOSS | 1,272 | 0.47 | 0.50 | 1,002 | 0.43 | 0.49 |
| FCR | 1,272 | 0.31 | 0.46 | 1,002 | 0.29 | 0.45 |
| SL_GR | 1,272 | 5.50 | 3.08 | 1,002 | 5.62 | 3.06 |
| M2B | 1,272 | 1.87 | 1.49 | 1,002 | 1.94 | 1.53 |
| CF | 1,272 | -0.38 | 2.74 | 1,002 | -0.42 | 2.92 |
| SDCF | 1,272 | 0.08 | 0.08 | 1,002 | 0.08 | 0.08 |
| SDS | 1,272 | 0.17 | 0.16 | 1,002 | 0.17 | 0.17 |
| SDI | 1,272 | 10.06 | 13.47 | 1,002 | 10.01 | 13.40 |
| TNGBTY | 1,272 | 0.22 | 0.23 | 1,002 | 0.21 | 0.23 |
| KSTR | 1,272 | 0.20 | 0.24 | 1,002 | 0.20 | 0.24 |
| MKSTR | 1,272 | 0.18 | 0.13 | 1,002 | 0.17 | 0.13 |
| OPCY | 1,272 | 4.97 | 1.33 | 1,002 | 5.01 | 1.38 |
| DVDS | 1,272 | 0.12 | 0.32 | 1,002 | 0.13 | 0.34 |

*Table 5.1 – Cont.*

**Panel C: MW1 Group Characteristics compared to MW2 Group Characteristics**

| | MW1 Group | | | MW2 Group | | |
|---|---|---|---|---|---|---|
| **Variable** | **Obs.** | **Mean** | **Std. Dev.** | **Obs.** | **Mean** | **Std. Dev.** |
| INVST | 1,002 | 14.47 | 20.48 | 191 | 12.13 | 16.83 |
| MKT_CAP | 1,002 | 1466.33 | 5654.06 | 191 | 1504.87 | 7087.28 |
| AGE_FIRM | 1,002 | 12.91 | 13.08 | 191 | 13.79 | 12.27 |
| LOSS | 1,002 | 0.43 | 0.49 | 191 | 0.55 | 0.50 |
| FCR | 1,002 | 0.29 | 0.45 | 191 | 0.35 | 0.48 |
| SL_GR | 1,002 | 5.62 | 3.06 | 191 | 5.49 | 3.11 |
| M2B | 1,002 | 1.94 | 1.53 | 191 | 1.75 | 1.38 |
| CF | 1,002 | -0.42 | 2.92 | 191 | -0.36 | 2.58 |
| SDCF | 1,002 | 0.08 | 0.08 | 191 | 0.08 | 0.08 |
| SDS | 1,002 | 0.17 | 0.17 | 191 | 0.17 | 0.16 |
| SDI | 1,002 | 10.01 | 13.40 | 191 | 10.51 | 13.82 |
| TNGBTY | 1,002 | 0.21 | 0.23 | 191 | 0.22 | 0.23 |
| KSTR | 1,002 | 0.20 | 0.24 | 191 | 0.21 | 0.26 |
| MKSTR | 1,002 | 0.17 | 0.13 | 191 | 0.18 | 0.13 |
| OPCY | 1,002 | 5.01 | 1.38 | 191 | 4.92 | 1.22 |
| DVDS | 1,002 | 0.13 | 0.34 | 191 | 0.09 | 0.28 |

**Panel D: MW2 Group Characteristics compared to MW3 Group Characteristics**

| | MW2 Group | | | MW3 Group | | |
|---|---|---|---|---|---|---|
| **Variable** | **Obs.** | **Mean** | **Std. Dev.** | **Obs.** | **Mean** | **Std. Dev.** |
| INVST | 191 | 12.13 | 16.83 | 58 | 9.85 | 12.49 |
| MKT_CAP | 191 | 1504.87 | 7087.28 | 58 | 2270.03 | 10209.43 |
| AGE_FIRM | 191 | 13.79 | 12.27 | 58 | 15.20 | 14.37 |
| LOSS | 191 | 0.55 | 0.50 | 58 | 0.55 | 0.50 |
| FCR | 191 | 0.35 | 0.48 | 58 | 0.38 | 0.49 |
| SL_GR | 191 | 5.49 | 3.11 | 58 | 4.98 | 3.14 |
| M2B | 191 | 1.75 | 1.38 | 58 | 1.85 | 1.55 |
| CF | 191 | -0.36 | 2.58 | 58 | -0.21 | 1.95 |
| SDCF | 191 | 0.08 | 0.08 | 58 | 0.08 | 0.08 |
| SDS | 191 | 0.17 | 0.16 | 58 | 0.18 | 0.17 |
| SDI | 191 | 10.51 | 13.82 | 58 | 10.64 | 14.62 |
| TNGBTY | 191 | 0.22 | 0.23 | 58 | 0.23 | 0.23 |
| KSTR | 191 | 0.21 | 0.26 | 58 | 0.19 | 0.26 |
| MKSTR | 191 | 0.18 | 0.13 | 58 | 0.17 | 0.12 |
| OPCY | 191 | 4.92 | 1.22 | 58 | 4.75 | 1.17 |
| DVDS | 191 | 0.09 | 0.28 | 58 | 0.08 | 0.27 |

*Table 5.1 – Cont.*

**Panel E: MW3 Group Characteristics compared to MW4 Group Characteristics**

| | MW3 Group | | | MW4 Group | | |
|---|---|---|---|---|---|---|
| **Variable** | **Obs.** | **Mean** | **Std. Dev.** | **Obs.** | **Mean** | **Std. Dev.** |
| INVST | 58 | 9.85 | 12.49 | 21 | 8.83 | 9.49 |
| MKT_CAP | 58 | 2270.03 | 10209.43 | 21 | 2525.30 | 10690.96 |
| AGE_FIRM | 58 | 15.20 | 14.37 | 21 | 16.97 | 12.93 |
| LOSS | 58 | 0.55 | 0.50 | 21 | 0.55 | 0.50 |
| FCR | 58 | 0.38 | 0.49 | 21 | 0.45 | 0.50 |
| SL_GR | 58 | 4.98 | 3.14 | 21 | 4.31 | 2.71 |
| M2B | 58 | 1.85 | 1.55 | 21 | 1.51 | 0.80 |
| CF | 58 | -0.21 | 1.95 | 21 | 0.01 | 0.52 |
| SDCF | 58 | 0.08 | 0.08 | 21 | 0.05 | 0.06 |
| SDS | 58 | 0.18 | 0.17 | 21 | 0.13 | 0.15 |
| SDI | 58 | 10.64 | 14.62 | 21 | 6.40 | 7.76 |
| TNGBTY | 58 | 0.23 | 0.23 | 21 | 0.25 | 0.23 |
| KSTR | 58 | 0.19 | 0.26 | 21 | 0.23 | 0.26 |
| MKSTR | 58 | 0.17 | 0.12 | 21 | 0.20 | 0.13 |
| OPCY | 58 | 4.75 | 1.17 | 21 | 4.83 | 1.30 |
| DVDS | 58 | 0.08 | 0.27 | 21 | 0.18 | 0.38 |

This table displays the descriptive statistics. Panel A compares control group characteristics to MW group characteristics. Panel B compares MW group characteristics to MW1 group characteristics. Panel C compares MW1 group characteristics to MW2 group characteristics. Panel D compares control MW2 characteristics to MW3 group characteristics. Panel E compares MW3 group characteristics to MW4 group characteristics. The observations from all panels are drawn from the time period of November 2004 through December 2009. All variables are defined within Appendix A.

**Table 5.2**
**Relation Between MW and Investment Efficiency**

| | Underinvestment | | Overinvestment | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Variables** | **INVSTEFF1** | **INVSTEFF2** | **INVSTEFF1** | **INVSTEFF2** |
| Intercept | -6.28*** | -6.24*** | 9.47** | 7.59* |
| | (1.72) | (1.68) | (4.46) | (4.37) |
| MW | -0.79*** | -0.73*** | 1.80*** | 1.86** |
| | (0.18) | (0.11) | (0.62) | (0.72) |
| MKT_CAP | 0.15*** | 0.15*** | -0.46*** | -0.41** |
| | (0.03) | (0.03) | (0.13) | (0.17) |
| AGE_FIRM | 0.27*** | 0.24* | -0.43 | -0.63** |
| | (0.10) | (0.13) | (0.27) | (0.25) |
| LOSS | -0.12 | -0.01 | 0.85 | 0.93 |
| | (0.17) | (0.21) | (1.12) | (0.95) |
| FCR | -0.26* | -0.31*** | 0.97*** | 0.75** |
| | (0.15) | (0.12) | (0.30) | (0.37) |
| SL_GR | -0.05* | -0.09*** | 0.14* | 0.19** |
| | (0.03) | (0.02) | (0.08) | (0.08) |
| M2B | 0.20* | 0.18 | -1.48*** | -1.40*** |
| | (0.12) | (0.12) | (0.31) | (0.29) |
| CF | 0.22*** | -0.02 | 0.20* | 0.09 |
| | (0.07) | (0.05) | (0.10) | (0.14) |
| SDCF | -2.28** | -1.02 | 0.86 | 1.17 |
| | (1.07) | (1.21) | (5.22) | (5.62) |
| SDS | -2.37*** | -1.99*** | -2.89 | -2.92 |
| | (0.46) | (0.44) | (2.30) | (2.24) |
| SDI | 0.01 | 0.00 | -0.11*** | -0.10*** |
| | (0.01) | (0.01) | (0.03) | (0.03) |
| TNGBTY | -2.63*** | -2.57*** | 2.08 | 2.62 |
| | (0.82) | (0.65) | (2.15) | (2.20) |
| KSTR | 1.50*** | 1.21*** | -2.51* | -1.87 |
| | (0.37) | (0.32) | (1.51) | (1.37) |
| MKSTR | -6.19*** | -6.20*** | -5.44 | -5.21* |
| | (1.18) | (1.39) | (3.53) | (3.00) |
| OPCY | -0.13 | -0.06 | -0.46 | -0.46** |
| | (0.09) | (0.07) | (0.31) | (0.22) |
| DVDS | -0.33* | -0.25* | -0.30 | -0.50 |
| | (0.19) | (0.13) | (0.74) | (0.72) |

*Table 5.2 cont.*

| | | | | |
|---|---|---|---|---|
| Industry FE | Included | Included | Included | Included |
| Firm Cluster | Yes | Yes | Yes | Yes |
| Year Cluster | Yes | Yes | Yes | Yes |
| Observations | 14,548 | 14,069 | 6,949 | 7,428 |
| Adj. R-squared | 43.80% | 37.30% | 15.60% | 17.30% |

Table 5.2 reports results for the following OLS regression:

$$INVSTEFFi_{i,t+1} = \beta_0 + \beta_1 * MW_{i,t} + \beta_2 * MKT\_CAP_{i,t} + \beta_3 * AGE\_FIRM_{i,t} + \beta_4 * LOSS_{i,t} + \beta_5 * FCR_{i,t} + \beta_6 * SL\_GR_{i,t} + \beta_7 * M2B_{i,t} + \beta_8 * CF_{i,t} + \beta_9 * SDCF_{i,t} + \beta_{10} * SDS_{i,t} + \beta_{11} * SDI_{i,t} + \beta_{12} * TNGBTY_{i,t} + \beta_{13} * KSTR_{i,t} + \beta_{14} * MKSTR_{i,t} + \beta_{15} * OPCY_{i,t} + \beta_{16} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t} \quad (1)$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by $^{***}$, $^{**}$, and $^{*}$, respectively, using two-tailed tests. All variables are defined in Appendix A.

**Table 5.3**
**Relation Between Multiple Consecutive MW and Investment Efficiency**

| | Underinvestment | | Overinvestment | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **VARIABLES** | **INVSTEFF1** | **INVSTEFF2** | **INVSTEFF1** | **INVSTEFF2** |
| Intercept | -6.01*** | -5.95*** | 9.30** | 7.50* |
| | (1.78) | (1.69) | (4.51) | (4.38) |
| MW1 | -0.57*** | -0.43** | 1.27*** | 1.22** |
| | (0.22) | (0.18) | (0.39) | (0.49) |
| MW2 | -1.49** | -1.85** | 2.96** | 3.08* |
| | (0.74) | (0.81) | (1.50) | (1.70) |
| MW3 | -2.23*** | -2.77*** | 4.04** | 4.51** |
| | (0.63) | (0.67) | (1.42) | (1.86) |
| MW4 | -5.60** | -3.72 | 5.61** | 5.62*** |
| | (2.61) | (3.74) | (1.73) | (1.11) |
| MKT_CAP | 0.15*** | 0.14*** | -0.46*** | -0.41** |
| | (0.03) | (0.03) | (0.13) | (0.17) |
| AGE_FIRM | 0.27*** | 0.24* | -0.41 | -0.62** |
| | (0.10) | (0.13) | (0.26) | (0.25) |
| LOSS | -0.13 | -0.01 | 0.84 | 0.93 |
| | (0.17) | (0.20) | (1.13) | (0.96) |
| FCR | 0.28* | 0.33*** | -0.97*** | -0.76** |
| | (0.15) | (0.12) | (0.30) | (0.37) |
| SL_GR | -0.05* | -0.09*** | 0.14* | 0.19** |
| | (0.03) | (0.02) | (0.08) | (0.07) |
| M2B | 0.19* | 0.17 | 1.49*** | 1.40*** |
| | (0.11) | (0.12) | (0.31) | (0.29) |
| CF | 0.22*** | -0.02 | -0.19* | -0.09 |
| | (0.07) | (0.04) | (0.10) | (0.14) |
| SDCF | 2.73** | 1.37 | 0.22 | 0.71 |
| | (1.08) | (1.14) | (5.21) | (5.53) |
| SDS | -2.47*** | -2.09*** | 3.10 | 3.08 |
| | (0.47) | (0.44) | (2.37) | (2.30) |
| SDI | 0.01 | 0.00 | 0.11*** | 0.10*** |
| | (0.01) | (0.01) | (0.03) | (0.03) |
| TNGBTY | 2.61*** | 2.50*** | -2.19 | -2.65 |
| | (0.85) | (0.67) | (2.16) | (2.20) |
| KSTR | -1.57*** | -1.25*** | -2.53* | -1.88 |
| | (0.39) | (0.32) | (1.51) | (1.38) |
| MKSTR | 6.25*** | 6.26*** | -5.47 | -5.22* |
| | (1.19) | (1.42) | (3.55) | (3.03) |
| OPCY | -0.17* | -0.10 | -0.43 | -0.44** |
| | (0.10) | (0.08) | (0.30) | (0.22) |
| DVDS | -0.32 | -0.25* | -0.32 | -0.53 |
| | (0.20) | (0.14) | (0.73) | (0.71) |

*Table 5.3 cont.*

| | | | | |
|---|---|---|---|---|
| Industry FE | Included | Included | Included | Included |
| Firm Cluster | Yes | Yes | Yes | Yes |
| Year Cluster | Yes | Yes | Yes | Yes |
| Observations | 14,548 | 14,069 | 6,949 | 7,428 |
| Adj. R-squared | 44.90% | 38.40% | 16.60% | 18.40% |

Table 5.3 reports results for the following OLS regression:

$$\begin{aligned} INVSTEFFi_{i,t+1} = {} & \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} + \beta_5 * MKT\_CAP_{i,t} + \beta_6 * AGE\_FIRM_{i,t} \\ & + \beta_7 * LOSS_{i,t} + \beta_8 * FCR_{i,t} + \beta_9 * SL\_GR_{i,t} + \beta_{10} * M2B_{i,t} + \beta_{11} * CF_{i,t} + \beta_{12} * SDCF_{i,t} + \beta_{13} * SDS_{i,t} \\ & + \beta_{14} * SDI_{i,t} + \beta_{15} * TNGBTY_{i,t} + \beta_{16} * KSTR_{i,t} + \beta_{17} * MKSTR_{i,t} + \beta_{18} * OPCY_{i,t} + \beta_{19} * DVDS_{i,t} \\ & + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by $^{***}$, $^{**}$, and $^{*}$, respectively, using two-tailed tests. All variables are defined in Appendix A.

**Table 5.4**
**Relation Between Multiple Consecutive MW and Investment Efficiency: Investment Specific MW Compared to All Other Types of MW**

| | Underinvestment | | Overinvestment | | Underinvestment | | Overinvestment | |
|---|---|---|---|---|---|---|---|---|
| | CE MW | Other MW | CE MW | Other MW | CE MW | Other MW | CE MW | Other MW |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Variables** | **INVSTEFF1** | **INVSTEFF1** | **INVSTEFF1** | **INVSTEFF1** | **INVSTEFF2** | **INVSTEFF2** | **INVSTEFF2** | **INVSTEFF2** |
| Intercept | -0.71* | -0.54** | 1.49 | 1.21* | -0.61 | -0.39** | 1.57 | 1.12 |
| | (0.38) | (0.22) | (1.69) | (0.70) | (0.47) | (0.16) | (1.59) | (0.86) |
| MW1 | -3.57*** | -0.58 | 3.42** | 2.89 | -1.05** | -0.39* | 2.22*** | 1.24* |
| | (0.47) | (0.82) | (1.55) | (1.83) | (0.46) | (0.24) | (0.67) | (0.78) |
| MW2 | -4.94*** | -1.44* | 4.16** | 3.49 | -2.44* | -1.22* | 3.44** | 2.15** |
| | (1.69) | (0.74) | (1.87) | (3.88) | (1.37) | (0.73) | (1.48) | (1.21) |
| MW3 | -5.73*** | -2.64 | 4.98*** | 3.10 | -5.39** | -1.17 | 4.81*** | 3.41* |
| | (0.38) | (1.72) | (1.36) | (2.26) | (2.43) | (2.24) | (1.23) | (1.98) |
| MKT_CAP | 0.25** | 0.28*** | -0.36 | -0.42 | 0.22* | 0.25** | -0.62** | -0.62** |
| | (0.10) | (0.10) | (0.25) | (0.28) | (0.12) | (0.13) | (0.29) | (0.26) |
| AGE_FIRM | 0.14 | 0.15 | -0.81 | -0.81 | 0.04 | 0.06 | -0.87 | -0.88 |
| | (0.17) | (0.18) | (1.18) | (1.16) | (0.20) | (0.21) | (0.98) | (0.98) |
| LOSS | -0.30** | -0.30** | 1.00*** | 0.93*** | -0.35*** | -0.34*** | 0.74* | 0.72** |
| | (0.14) | (0.15) | (0.37) | (0.28) | (0.12) | (0.12) | (0.43) | (0.35) |
| FCR | -0.05* | -0.05* | 0.12 | 0.13* | -0.08*** | -0.09*** | 0.17** | 0.19** |
| | (0.03) | (0.03) | (0.07) | (0.08) | (0.02) | (0.02) | (0.07) | (0.07) |
| SL_GR | 0.18 | 0.19* | 1.51*** | 1.48*** | 0.15 | 0.17 | 1.43*** | 1.39*** |
| | (0.11) | (0.11) | (0.29) | (0.30) | (0.12) | (0.12) | (0.28) | (0.28) |
| M2B | 0.22*** | 0.22*** | 0.15* | 0.21** | -0.02 | -0.02 | -0.06 | -0.10 |
| | (0.07) | (0.07) | (0.09) | (0.10) | (0.05) | (0.05) | (0.11) | (0.14) |
| CF | 2.08* | 2.68** | 0.01 | 0.10 | 0.63 | 1.14 | 0.54 | 0.83 |
| | (1.24) | (1.11) | (5.20) | (5.40) | (1.05) | (1.21) | (5.75) | (5.66) |
| SDCF | 2.12*** | 2.45*** | -4.02* | -3.16 | 1.77*** | 2.07*** | -3.95* | -3.04 |
| | (0.45) | (0.49) | (2.17) | (2.47) | (0.44) | (0.44) | (2.13) | (2.39) |

*Table 5.4 – Cont.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SDS | 0.00 | 0.00 | 0.11*** | 0.11*** | 0.00 | 0.00 | 0.10*** | 0.10*** |
| | (0.01) | (0.01) | (0.03) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) |
| SDI | 2.74*** | 2.64*** | 2.13 | 2.27 | 2.60*** | 2.57*** | 2.73 | 2.74 |
| | (0.86) | (0.88) | (2.13) | (2.14) | (0.67) | (0.72) | (2.17) | (2.13) |
| TNGBTY | 1.53*** | 1.55*** | -2.77* | -2.66* | 1.25*** | 1.27*** | -2.11 | -2.05 |
| | (0.39) | (0.38) | (1.67) | (1.53) | (0.31) | (0.30) | (1.43) | (1.38) |
| KSTR | -6.08*** | -6.21*** | -5.66 | -5.41 | -6.15*** | -6.25*** | -5.33* | -5.18* |
| | (1.15) | (1.20) | (3.77) | (3.47) | (1.39) | (1.43) | (3.12) | (2.96) |
| MKSTR | 0.14 | 0.19** | -0.47* | -0.44 | -0.07 | -0.11 | -0.49** | -0.45** |
| | (0.12) | (0.10) | (0.27) | (0.29) | (0.09) | (0.07) | (0.23) | (0.22) |
| OPCY | -0.33 | -0.33* | -0.25 | -0.36 | -0.28* | -0.26** | -0.49 | -0.54 |
| | (0.22) | (0.20) | (0.69) | (0.74) | (0.15) | (0.13) | (0.70) | (0.71) |
| DVDS | -0.001 | 0.000 | 0.004** | 0.003* | -0.002* | -0.001 | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Industry FE | Included | Included | Included | Included | Included | Included | Included | Included |
| Firm Cluster | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Cluster | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 9,889 | 10,273 | 4,774 | 4,923 | 9,565 | 9,934 | 5,099 | 5,264 |
| Adj. R-squared | 45.90% | 43.80% | 18.00% | 15.50% | 39.50% | 37.40% | 19.70% | 17.30% |

Table 5.4 reports the results for the following OLS regression:

$$INVSTEFFi_{i,t+1} = \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} + \beta_5 * MKT\_CAP_{i,t} + \beta_6 * AGE\_FIRM_{i,t} + \beta_7 * LOSS_{i,t} + \beta_8 * FCR_{i,t} + \beta_9 * SL\_GR_{i,t} + \beta_{10} * M2B_{i,t} + \beta_{11} * CF_{i,t} + \beta_{12} * SDCF_{i,t} + \beta_{13} * SDS_{i,t} + \beta_{14} * SDI_{i,t} + \beta_{15} * TNGBTY_{i,t} + \beta_{16} * KSTR_{i,t} + \beta_{17} * MKSTR_{i,t} + \beta_{18} * OPCY_{i,t} + \beta_{19} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t} \quad (2)$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by ***, **, and *, respectively, using two-tailed tests. All variables are defined in Appendix A.

**Table 5.5**
**Summary of Main Results**

| Hypothesis | Equation Used to Test Hypothesis | Hypotheses Confirmed | Univariate Results | Multivariate Results |
|---|---|---|---|---|
| H1: FRQ issues lead to greater investment inefficiency | $INVSTEFFi_{i,t+1} = \beta_0 + \beta_1 * MW_{i,t} + \beta_2 * MKT\_CAP_{i,t} + \beta_3 * AGE\_FIRM_{i,t} + \beta_4 * LOSS_{i,t} + \beta_5 * FCR_{i,t} + \beta_6 * SL\_GR_{i,t} + \beta_7 * M2B_{i,t} + \beta_8 * CF_{i,t} + \beta_9 * SDCF_{i,t} + \beta_{10} * SDS_{i,t} + \beta_{11} * SDI_{i,t} + \beta_{12} * TNGBTY_{i,t} + \beta_{13} * KSTR_{i,t} + \beta_{14} * MKSTR_{i,t} + \beta_{15} * OPCY_{i,t} + \beta_{16} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t}$ | ✓ | Figure 5.1 | Table 5.2 |
| H2: Firms that report FRQ issues in multiple consecutive years have a higher level of investment inefficiency | $INVSTEFFi_{i,t+1} = \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} + \beta_5 * MKT\_CAP_{i,t} + \beta_6 * AGE\_FIRM_{i,t} + \beta_7 * LOSS_{i,t} + \beta_8 * FCR_{i,t} + \beta_9 * SL\_GR_{i,t} + \beta_{10} * M2B_{i,t} + \beta_{11} * CF_{i,t} + \beta_{12} * SDCF_{i,t} + \beta_{13} * SDS_{i,t} + \beta_{14} * SDI_{i,t} + \beta_{15} * TNGBTY_{i,t} + \beta_{16} * KSTR_{i,t} + \beta_{17} * MKSTR_{i,t} + \beta_{18} * OPCY_{i,t} + \beta_{19} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t}$ | ✓ | Figure 5.1 | Table 5.3 |
| H3: Investment inefficiency increases as firms continue to report FRQ issues | | ✓ | Figure 5.1 | Table 5.3 |
| H4: Investment-specific FRQ issues have a greater impact on investment efficiency than non-investment-specific FRQ issues | | ✓ | | Table 5.4 |

**Table 5.6**
**Biddle et al. (2009) Replication**

| | Underinvestment compared to normal investment | | Overinvestment compared to normal investment | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Variables** | **Coefficient** | **Std. Error** | **Coefficient** | **Std. Error** |
| AQ | -2.54** | (0.99) | -2.45** | (1.23) |
| INSTIT | -0.24** | (0.10) | 0.11 | (0.10) |
| ANLYT | -0.01** | (0.00) | 0.00 | (0.00) |
| IG_SCORE | -0.01 | (0.02) | -0.04** | (0.02) |
| DG_SCORE | 0.07 | (0.16) | -0.32** | (0.15) |
| LGASST | -0.05** | (0.02) | -0.10*** | (0.02) |
| M2B | -0.13*** | (0.03) | 0.20*** | (0.03) |
| SDCF | -2.74*** | (0.69) | -0.72 | (0.60) |
| SDS | 0.91*** | (0.25) | 0.40* | (0.24) |
| SDI | 0.00 | (0.00) | 0.01*** | (0.00) |
| Z_SC | 0.02 | (0.05) | -0.16*** | (0.06) |
| TNGBTY | -1.61*** | (0.21) | 1.19*** | (0.19) |
| KSTR | 1.12*** | (0.18) | -1.76*** | (0.19) |
| MKSTR | -2.90*** | (0.40) | -0.10 | (0.35) |
| CF | 0.06*** | (0.02) | -0.04** | (0.02) |
| SLACK | 0.01*** | (0.00) | -0.01*** | (0.00) |
| DVDS | 0.12 | (0.07) | -0.26*** | (0.06) |
| FIRM_AGE | 0.01** | (0.00) | -0.01*** | (0.00) |
| OPCY | -0.08 | (0.05) | -0.22*** | (0.04) |
| LOSS | 0.14** | (0.07) | -0.04 | (0.06) |
| | | | | |
| Industry FE | Included | | Included | |
| Year Fixed Effects | Included | | Included | |
| Firm Cluster | Yes | | Yes | |
| Observations | 21,459 | | 21,459 | |
| Pseudo R-Sq | 13.96% | | 13.96% | |

Table 5.6 reports the results for the following multinomial logistic regression:

$$INVSTQ_{i,t+1} = \beta_0 + \beta_1 * AQ_{i,t} + \beta_2 * INSTIT_{i,t} + \beta_3 * ANLYT_{i,t} + \beta_4 * IG\_SCORE_{i,t} + \beta_5 * DG\_SCORE_{i,t} + \beta_6 * LGASST_{i,t} + \beta_7 * M2B_{i,t} + \beta_8 * SDCF_{i,t} + \beta_9 * SDS_{i,t} + \beta_{10} * SDI_{i,t} + \beta_{11} * Z\_SC_{i,t} + \beta_{12} * TNGBTY_{i,t} + \beta_{13} * KSTR_{i,t} + \beta_{14} * MKSTR_{i,t} + \beta_{15} * CF_{i,t} + \beta_{16} * DVDS_{i,t} + \beta_{17} * AGE\_FIRM_{i,t} + \beta_{18} * OPCY_{i,t} + \beta_{19} * LOSS_{i,t} + IndustryFixedEffects + YearFixedEffects + \varepsilon_{i,t}$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by ***, **, and *, respectively, using two-tailed tests. All variables are defined in Appendix A.

**Table 5.7**
**Cheng et al. (2011) Replication**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Variables** | **Coefficient** | **Std. Error** | **Coefficient** | **Std. Error** |
| Intercept | 11.05*** | (3.45) | 8.47*** | (2.67) |
| MW(t-1) | -2.61* | (1.53) | -4.19* | (2.41) |
| MW(t+1) | | | -4.56*** | (1.44) |
| MW(t+2) | | | -2.99 | (2.02) |
| IE | -1.35 | (7.73) | -2.88** | (1.23) |
| MW(t-1)*IE | 4.40*** | (1.39) | 6.90** | (3.03) |
| MW(t+1)*IE | | | 6.65 | (4.42) |
| MW(t+2)*IE | | | 4.91 | (3.02) |
| INSTIT | 5.43*** | (1.47) | 7.05*** | (2.25) |
| ANLYT | -0.17** | (0.08) | 0.16 | (0.11) |
| G_SCORE | -1.06* | (0.64) | -0.24 | (0.16) |
| DG_SCORE | 1.79** | (0.81) | 1.83** | (0.82) |
| DG_SCORE*IE | -5.70** | (2.77) | -3.70 | (2.77) |
| AQ | 26.79* | (15.18) | 14.06 | (10.69) |
| AQ*IE | -31.75** | (14.65) | -17.62 | (13.72) |
| INSTIT*IE | -6.67*** | (2.07) | -7.76* | (4.32) |
| ANLYT*IE | 0.21* | (0.12) | -0.24 | (0.15) |
| G_SCORE*IE | 1.75* | (0.97) | 0.48* | (0.25) |
| MB | 0.03 | (0.08) | -0.02 | (0.10) |
| LGASST | -0.48*** | (0.17) | -0.42*** | (0.16) |
| SDCF | 19.61** | (8.84) | 28.39*** | (4.53) |
| SDS | -4.50* | (2.38) | -1.74 | (2.53) |
| SDI | 0.07 | (0.05) | 0.04 | (0.03) |
| Z_SC | -1.11*** | (0.25) | -1.60*** | (0.23) |
| TNGBTY | 7.54*** | (2.45) | 6.90*** | (0.99) |
| KSTR | -0.49 | (2.30) | -1.95 | (1.29) |
| MKSTR | -18.64*** | (3.89) | -10.24** | (5.10) |
| CF | -1.25 | (2.23) | -7.17* | (4.10) |
| DVDS | -0.61 | (0.46) | -0.52 | (0.54) |
| OPCY | -1.34*** | (0.34) | -0.44 | (0.28) |
| LOSS | -2.58*** | (0.53) | 0.22 | (0.78) |
| M2B | 1.61*** | (0.25) | 1.70*** | (0.42) |
| REST | 3.63 | (4.81) | 2.62 | (2.90) |
| FCR | -0.37 | (0.51) | -0.51 | (0.52) |
| SL_GR | 6.73*** | (1.16) | 8.00*** | (0.65) |
| AGE_FIRM | -1.00*** | (0.27) | -0.04*** | (0.01) |
| Industry FE | Included | | Included | |
| Firm Cluster | Yes | | Yes | |
| Year Cluster | Yes | | Yes | |
| Observations | 5,133 | | 12,876 | |
| Adj. R-squared | 31.90% | | 27.40% | |

*Table 5.7 Cont.*

Columns 1 and 2 report results for the following OLS regression:

$$INVST_{i,t} = \beta_0 + \beta_1 * MWFIRM_{i,t-1} + \beta_2 * MWFIRM_{i,t-1} * IE_{i,t} + \sum \alpha_i * MWFIRMDet_{i,t-1} + \sum \gamma_i * INVDet_{i,t-1} + \\ + \sum \delta_i * GOV_{i,t-1} + \sum \delta_i * GOV_{i,t-1} * IE_{i,t} \quad (6)$$

Columns 3 and 4 report results for the following OLS regression:

$$INVST_i = \beta_0 + \beta_1 * MWFIRM_{i,t-1} + \beta_2 * MWFIRM_{i,t-1} * IE_{i,t} + \beta_3 * MWFIRM_{i,t+1} + \beta_4 * MWFIRM_{i,t+1} * IE_{i,t+2} \\ + \beta_5 * MWFIRM_{i,t+2} + \beta_6 * MWFIRM_{i,t+2} * IE_{i,t+3} + \sum \alpha_i * MWFIRMDet_i + \sum \gamma_i * INVDet_i \quad (7) \\ + \sum \delta_i * GOV_i + \sum \delta_i * GOV_i * IE_i$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by $^{***}$, $^{**}$, and $^{*}$, respectively, using two-tailed tests. All variables are defined in Appendix A.

## Table 5.8
## Conditional Relation Between Multiple Consecutive Years of MW and Investment Efficiency

| | | (1) | (2) |
|---|---|---|---|
| | | INVST | |
| **Variables** | | **Coefficient** | **Std. Error** |
| Intercept | | 2.82 | (3.03) |
| MW1 (1) | Underinvestment | -2.52* | (1.43) |
| MW2 (2) | Underinvestment | -5.06* | (3.02) |
| MW3 (3) | Underinvestment | -7.53*** | (1.50) |
| MW4 (4) | Underinvestment | -8.99*** | (2.63) |
| IE | | -6.69*** | (2.17) |
| MW1*IE (5) | | 6.03** | (2.45) |
| MW2*IE (6) | | 10.54* | (5.90) |
| MW3*IE (7) | | 12.14*** | (3.43) |
| MW4*IE (8) | | 15.48*** | (4.87) |
| (1) + (5) | Overinvestment | p=0.02** | |
| (2) + (6) | Overinvestment | p=0.07* | |
| (3) + (7) | Overinvestment | p=0.03** | |
| (4) + (8) | Overinvestment | p=0.01*** | |
| MKT_CAP | | 0.14 | (0.11) |
| AGE_FIRM | | -0.94*** | (0.16) |
| LOSS | | 0.81 | (0.57) |
| FCR | | -0.63* | (0.33) |
| SL_GR | | 0.92*** | (0.11) |
| M2B | | 1.30*** | (0.24) |
| CF | | -0.68*** | (0.16) |
| SDCF | | 34.93*** | (3.44) |
| SDS | | -4.61*** | (1.47) |
| SDI | | 0.05** | (0.03) |
| TNGBTY | | 8.63*** | (1.12) |
| KSTR | | 0.43 | (0.83) |
| MKSTR | | -8.93*** | (2.88) |
| OPCY | | 0.04 | (0.15) |
| DVDS | | -1.43*** | (0.26) |
| Industry FE | | Included | |
| Firm Cluster | | Yes | |
| Year Cluster | | Yes | |
| Observations | | 21,459 | |
| R-squared | | 30.30% | |

Table 5.8 reports the OLS regression results for the following equation

$$\begin{aligned} INVST_{i,t+1} = {} & \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} + \beta_5 * IE_{i,t+1} + \beta_6 * MW1_{i,t} * IE_{i,t+1} \\ & + \beta_7 * MW2_{i,t} * IE_{i,t+1} + \beta_8 * MW3_{i,t} * IE_{i,t+1} + \beta_9 * MW4_{i,t} * IE_{i,t+1} + \beta_{10} * MKT\_CAP_{i,t} + \beta_{11} * AGE\_FIRM_{i,t} \\ & + \beta_{12} * LOSS_{i,t} + \beta_{13} * FCR_{i,t} + \beta_{14} * SL\_GR_{i,t} + \beta_{15} * M2B_{i,t} + \beta_{16} * CF_{i,t} + \beta_{17} * SDCF_{i,t} + \beta_{18} * SDS_{i,t} \\ & + \beta_{19} * SDI_{i,t} + \beta_{20} * TNGBTY_{i,t} + \beta_{21} * KSTR_{i,t} + \beta_{22} * MKSTR_{i,t} + \beta_{23} * OPCY_{i,t} + \beta_{24} * DVDS_{i,t} \\ & + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (8)$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by ***, **, and *, respectively, using two-tailed tests. All variables are defined in Appendix A.

**Table 5.9**
**Relation Between Multiple Consecutive MW and Change in Investment Efficiency**

| | Underinvestment | | Overinvestment | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **VARIABLES** | **ΔINVSTEFF1** | **ΔINVSTEFF2** | **ΔINVSTEFF1** | **ΔINVSTEFF2** |
| Constant | -3.11 | -3.58 | 9.98*** | 5.58*** |
| | (2.21) | (2.30) | (3.30) | (1.42) |
| MW1 | -1.39** | -1.44** | 1.30* | 1.27* |
| | (0.65) | (0.71) | (0.74) | 0.69 |
| MW2 | -1.80** | -2.10** | 1.27* | 1.24* |
| | (0.86) | (0.91) | (0.73) | (0.71) |
| MW3 | -2.80* | -2.67* | 1.56** | 1.79** |
| | (1.62) | (1.39) | (0.73) | (0.74) |
| MW4 | -1.58*** | -3.09 | 2.63*** | 2.57 |
| | (0.47) | (3.61) | (0.81) | (2.67) |
| MKT_CAP | 0.09 | 0.11 | -0.21* | -0.12 |
| | (0.08) | (0.10) | (0.12) | (0.13) |
| AGE_FIRM | 0.18 | 0.19 | 0.08 | 0.06 |
| | (0.19) | (0.22) | (0.29) | (0.29) |
| LOSS | -0.45* | -0.44 | 0.39*** | 0.32*** |
| | (0.24) | (0.32) | (0.07) | (0.07) |
| FCR | 0.89** | 0.92** | -0.12 | -0.17 |
| | (0.36) | (0.43) | (0.34) | (0.28) |
| SL_GR | -0.73*** | -0.71*** | -0.57*** | -0.49*** |
| | (0.11) | (0.10) | (0.09) | (0.08) |
| M2B | 0.16 | 0.10 | 0.08 | 0.10 |
| | (0.21) | (0.24) | (0.19) | (0.21) |
| CF | 0.18 | 0.28 | 0.05 | -0.02 |
| | (0.17) | (0.21) | (0.19) | (0.12) |
| SDCF | -1.66*** | -1.19*** | -2.54*** | -2.71*** |
| | (0.21) | (0.25) | (0.64) | (0.67) |
| SDS | 1.26 | 0.452 | 3.47 | 5.328* |
| | (0.98) | (1.08) | (3.01) | (2.84) |
| SDI | -0.01 | -0.01 | 0.05 | 0.05 |
| | (0.02) | (0.02) | (0.03) | (0.03) |
| TNGBTY | -2.13 | -2.83* | -9.05*** | -7.45** |
| | (1.63) | (1.54) | (3.44) | (3.24) |
| KSTR | -5.78*** | -5.86*** | -2.98 | -2.26 |
| | (1.96) | (2.16) | (2.20) | (1.64) |
| MKSTR | 7.46*** | 8.16*** | -6.99** | -6.58*** |
| | (1.92) | (2.89) | (3.16) | (2.48) |
| OPCY | -0.47** | -0.53*** | -0.27 | 0.03 |
| | (0.20) | (0.17) | (0.32) | (0.34) |
| DVDS | 0.70*** | 0.68*** | 0.80 | 0.36 |
| | (0.15) | (0.15) | (0.51) | (0.42) |

*Table 5.9 Cont.*

| | | | | |
|---|---|---|---|---|
| Industry FE | Included | Included | Included | Included |
| Firm Cluster | Yes | Yes | Yes | Yes |
| Year Cluster | Yes | Yes | Yes | Yes |
| Observations | 13,732 | 13,425 | 6,115 | 6,422 |
| Adj. R-squared | 17.60% | 17.00% | 12.70% | 12.60% |

Table 5.9 reports the results for the following OLS regression:

$$\begin{aligned}\Delta INVSTEFFi_{i,t+1} = {} & \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} + \beta_5 * MKT\_CAP_{i,t} + \beta_6 * AGE\_FIRM_{i,t} \\ & + \beta_7 * LOSS_{i,t} + \beta_8 * FCR_{i,t} + \beta_9 * SL\_GR_{i,t} + \beta_{10} * M2B_{i,t} + \beta_{11} * CF_{i,t} + \beta_{12} * SDCF_{i,t} + \beta_{13} * SDS_{i,t} \\ & + \beta_{14} * SDI_{i,t} + \beta_{15} * TNGBTY_{i,t} + \beta_{16} * KSTR_{i,t} + \beta_{17} * MKSTR_{i,t} + \beta_{18} * OPCY_{i,t} + \beta_{19} * DVDS_{i,t} \\ & + IndustryFixedEffects + \varepsilon_{i,t}\end{aligned}$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by $^{***}$, $^{**}$, and $^{*}$, respectively, using two-tailed tests. All variables are defined in Appendix A.

**Table 5.10**
**Relation Between Multiple Consecutive MW and Investment Efficiency with Additional Control Variables**

| | Underinvestment | | Overinvestment | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **VARIABLES** | **INVSTEFF1** | **INVSTEFF2** | **INVSTEFF1** | **INVSTEFF2** |
| Intercept | -4.10** | -5.37*** | 8.66*** | 7.15*** |
| | (2.05) | (1.79) | (2.32) | (2.30) |
| MW1 | -0.88*** | -0.78** | 1.96** | 1.38** |
| | (0.32) | (0.31) | (0.79) | (0.70) |
| MW2 | -1.26 | -1.47** | 2.80** | 3.17*** |
| | (0.81) | (0.65) | (1.35) | (1.03) |
| MW3 | -2.39*** | -2.71*** | 3.90 | 4.03* |
| | (0.52) | (0.51) | (3.28) | (2.56) |
| MW4 | -2.74*** | -3.14*** | 5.15** | 5.51* |
| | (0.52) | (0.42) | (2.02) | (3.13) |
| AQ | 3.181* | 2.674* | 2.02* | 3.12* |
| | (1.59) | (1.46) | (1.14) | (1.84) |
| ISTIT | -0.43 | -0.33 | 3.63** | 3.64** |
| | (0.31) | (0.35) | (1.55) | (1.79) |
| ANLYT | 0.07*** | 0.08*** | -0.10 | -0.06 |
| | (0.02) | (0.01) | (0.06) | (0.06) |
| IG_SCORE | 0.05 | 0.03 | 0.08 | 0.10 |
| | (0.04) | (0.04) | (0.12) | (0.13) |
| DG_SCORE | -0.53 | -0.24 | -0.03 | 0.18 |
| | (0.46) | (0.43) | (1.45) | (1.36) |
| MKT_CAP | 0.12** | 0.11* | -0.20 | -0.27 |
| | (0.06) | (0.06) | (0.23) | (0.26) |
| AGE_FIRM | 0.18 | 0.16 | -0.46 | -0.59 |
| | (0.12) | (0.14) | (0.65) | (0.55) |
| LOSS | -0.42* | -0.23 | 1.14 | 1.43 |
| | (0.23) | (0.25) | (1.48) | (1.18) |
| FCR | 0.19 | 0.33 | -1.47** | -1.25* |
| | (0.17) | (0.20) | (0.62) | (0.65) |
| SL_GR | -0.07** | -0.13*** | 0.22 | 0.22* |
| | (0.03) | (0.03) | (0.17) | (0.13) |
| M2B | 0.29* | 0.23 | 1.16*** | 1.12*** |
| | (0.17) | (0.17) | (0.37) | (0.33) |
| CF | -0.15* | 0.12 | -0.42** | -0.37** |
| | (0.08) | (0.11) | (0.20) | (0.16) |
| SDCF | 4.68** | 2.61* | 1.45 | 2.94 |
| | (2.10) | (1.34) | (4.89) | (7.04) |
| SDS | -2.46*** | -1.91*** | 4.34 | 3.48 |
| | (0.55) | (0.54) | (2.78) | (3.31) |

*Table 5.10 Cont.*

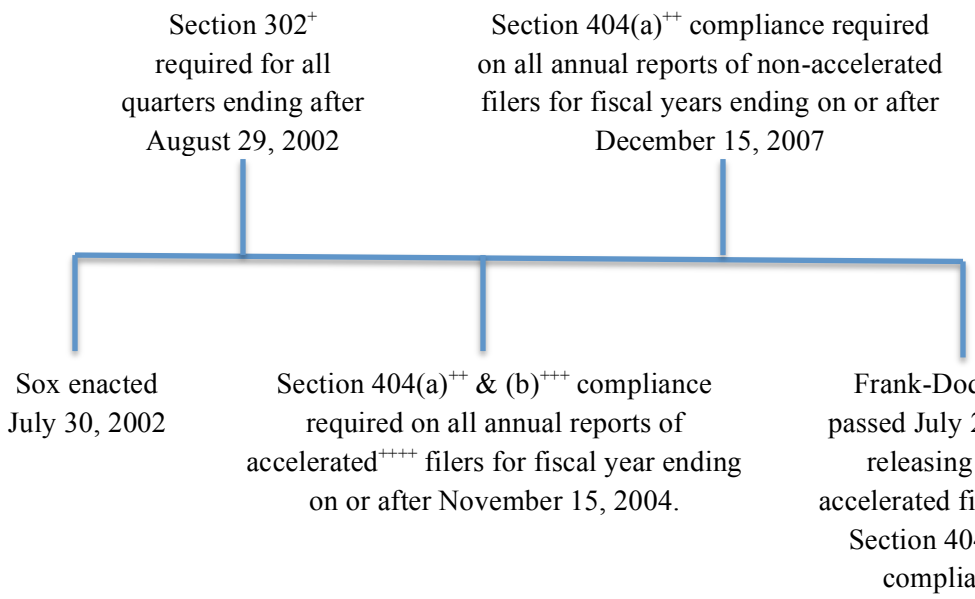
| | | | | |
|---|---|---|---|---|
| SDI | 0.01 | 0.01 | 0.08*** | 0.08*** |
| | (0.01) | (0.01) | (0.03) | (0.03) |
| TNGBTY | 2.84*** | 2.67*** | 3.32 | 3.62 |
| | (1.04) | (0.77) | (2.77) | (2.93) |
| KSTR | -2.47*** | -2.12*** | -5.68*** | -5.09*** |
| | (0.50) | (0.47) | (1.56) | (1.37) |
| MKSTR | 7.87*** | 8.29*** | -13.32*** | -11.95** |
| | (1.78) | (1.73) | (4.68) | (4.94) |
| OPCY | -0.24* | -0.15 | -0.51 | -0.57* |
| | (0.13) | (0.11) | (0.41) | (0.33) |
| DVDS | -0.39 | -0.32 | 0.19 | 0.10 |
| | (0.27) | (0.20) | (1.08) | (1.15) |
| SLACK | 0.00 | 0.00 | -0.01 | -0.01 |
| | (0.00) | (0.00) | (0.01) | (0.02) |
| Industry FE | Included | Included | Included | Included |
| Firm Cluster | Yes | Yes | Yes | Yes |
| Year Cluster | Yes | Yes | Yes | Yes |
| Observations | 14,414 | 14,013 | 6,965 | 7,366 |
| Adj. R-squared | 37.70% | 32.20% | 15.00% | 15.70% |

Table 5.10 reports the results for the following OLS regression:

$$\begin{aligned} INVSTEFFi_{i,t+1} = {} & \beta_0 + \beta_1 * MW1_{i,t} + \beta_2 * MW2_{i,t} + \beta_3 * MW3_{i,t} + \beta_4 * MW4_{i,t} + \beta_5 * AQ_{i,t} + \beta_6 * INSTIT_{i,t} \\ & + \beta_7 * ANLYT_{i,t} + \beta_8 * IG\_SCORE_{i,t} + \beta_9 * DG\_SCORE_{i,t} + \beta_{10} * MKT\_CAP_{i,t} \\ & + \beta_{11} * AGE\_FIRM_{i,t} + \beta_{12} * LOSS_{i,t} + \beta_{13} * FCR_{i,t} + \beta_{14} * SL\_GR_{i,t} + \beta_{15} * M2B_{i,t} + \beta_{16} * CF_{i,t} \\ & + \beta_{17} * SDCF_{i,t} + \beta_{18} * SDS_{i,t} + \beta_{19} * SDI_{i,t} + \beta_{20} * TNGBTY_{i,t} + \beta_{21} * KSTR_{i,t} + \beta_{22} * MKSTR_{i,t} \\ & + \beta_{23} * OPCY_{i,t} + \beta_{24} * DVDS_{i,t} + IndustryFixedEffects + \varepsilon_{i,t} \end{aligned} \quad (9)$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by ***, **, and *, respectively, using two-tailed tests. All variables are defined in Appendix A.

**Figure 2.1**
**SOX Timeline**




**+SOX 302 Requirements**

- Quarterly and annual certification by the CEO and CFO that must contain:
  - Statements that officers are responsible for firm's internal control
  - Statements that officers have evaluated the internal control systems
  - Disclosure of any material weaknesses in internal control (MW)
- Disclosure of significant deficiencies in internal control to the audit committee, board, and company auditors

**++SOX 404(a) Requirements**

- Assessment of internal control system by firm's management that must contain:
  - Statements that management is responsible for establishing and maintaining the internal control system
  - An assessment on the effectiveness of the internal control system
  -

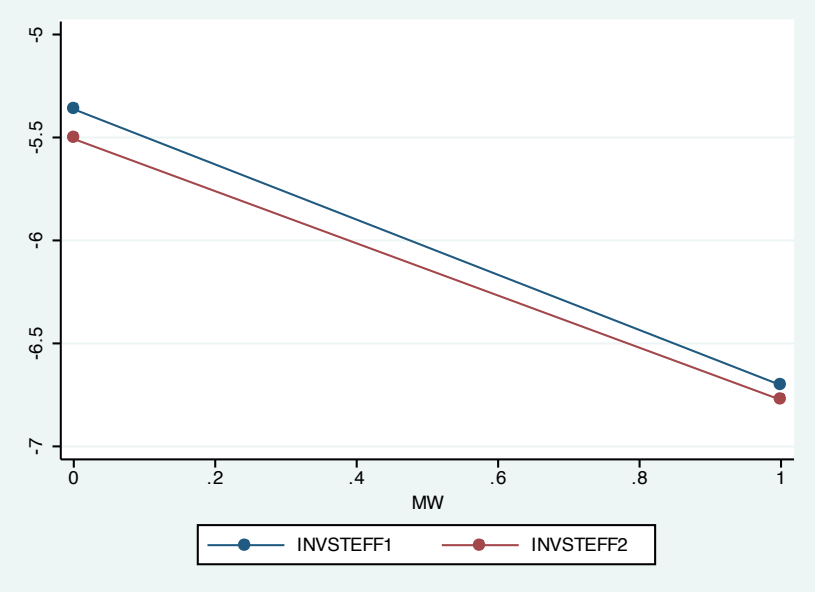
**+++SOX 404(b) Requirements**

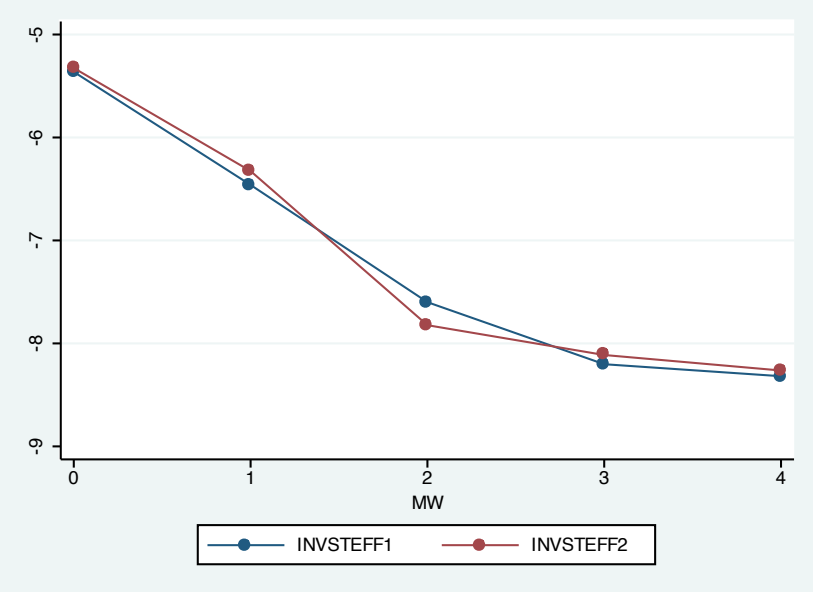
- Firm's external auditors will attest to and report on management's assessment of internal control.

++++Filers with the SEC can be categorized as either accelerated or non-accelerated filers. An accelerated filer is defined by the SEC as: " (1) the issuer had an aggregate market value of voting and non- voting common equity held by non-affiliates of the issuer of $75 million or more, as of the last business day of the issuer's most recently completed second fiscal quarter; (2) the issuer had been subject to the reporting requirements of Section 13(a) or 15(d) of the Exchange Act [15 U.S.C. 78m(a) or 78o(d)] for a period of at least 12 calendar months; (3) the issuer previously had filed at least one annual report; and (4) the issuer was not eligible to use Forms 10-KSB and 10-QSB [17 CFR 249.310b and 17 CFR 249.308b] for its annual and quarterly reports" (SEC 2005)

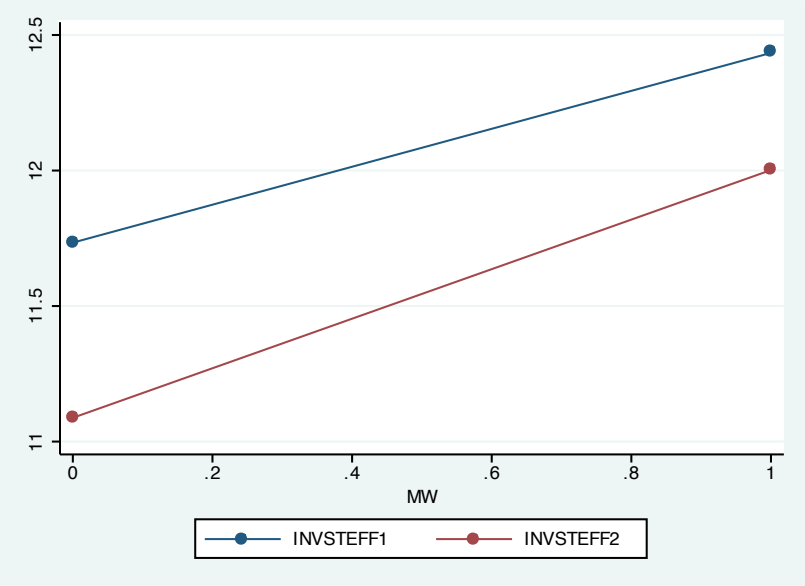
**Figure 5.1**
**Comparison of Investment Residuals Across MW Categories**

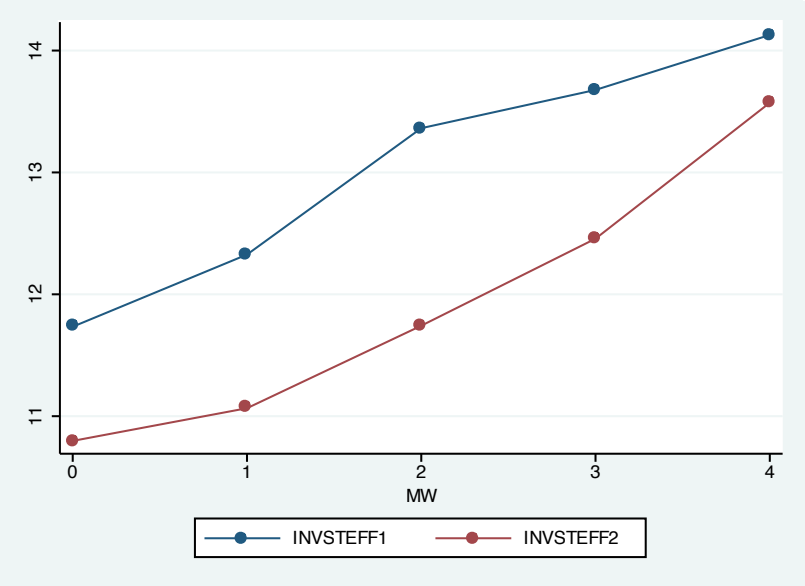
**Panel A: Mean INVST Underinvestment Residuals**



**Panel B: Mean INVST Overinvestment Residuals**



## Appendix A
## Investment Study Variable Definitions

**Dependent Variables:**

*INVST* = The sum of acquisition expenditures, capital investment expenditures and research and development expenditures minus sales of property, plant and equipment. This value is then multiplied by 100 and then scaled by the lagged value of total assets.

*INVSTEFF1* = Residual of $INVST=\beta0 + \beta1*SaleGr + \varepsilon,$ where *INVST* is measured in year t+1, *SaleGr* is measured as the percentage change in sales from year t-1 to t. This equation is estimated for each industry year based on the Fama and French 48 industry classification for all industries with at least 10 observations in each given year.

*INVSTEFF2* = Residual of $INVST=\beta0 + \beta1*NEG+ \beta2*SaleGr +\beta3*NEG*SaleGr +\varepsilon,$ where *INVST* is measured in year t+1, NEG is an indicator variable that is assigned a value of one for negative sales growth and zero otherwise, *SaleGr* is measured as the percentage change in sales from year t-1 to t. This equation is estimated for each industry year based on the Fama and French 48 industry classification for all industries with at least 10 observations in each given year.

**Key Independent Variables:**

*MW1* = If the observation represents MW reported for the first time (no previous MW reported), it is assigned an indicator variable of 1, zero otherwise.

*MW2* = If the observation represents MW reported in a second consecutive year, it is assigned an indicator variable of 1, zero otherwise.

*MW3* = If the observation represents MW reported in a third consecutive year, it is assigned an indicator variable of 1, zero otherwise.

*MW4* = If the observation represents MW reported in four or more consecutive years, it is assigned an indicator variable of 1, zero otherwise.

**MW Control Variables:**

*MKT_CAP* = The logarithm of each firm's market capitalization.

*AGE_FIRM* = The logarithm of the number of years the firm has reported within the CRSP database.

*LOSS* = Sum of earnings before extraordinary items (Compustat Data item IB) in years t and (t-1). If this sum totals less than zero, the firm is assigned an indicator variable of 1, 0 otherwise.

*FCR* = If the firm has a non-zero value associated with the foreign currency translation (Compustat data item FCA item, the observation is assigned an indicator variable of 1, zero otherwise.

*SL_GR* = Decile ranking of the year over year sales (Compustat data item SALE) growth for years t-2 through t.

**Investment Control Variables:**

*M2B* = Total assets plus market value of common stock minus book value of equity minus deferred taxes divided by total assets.

*CF* = Cash flow from operating activities divided by sales.

*SDCF* = Standard deviation of cash flows scaled by average total assets for the time period of t-5 through t-1.

*SDS* = Standard deviation of sales scaled by average total assets for the time period of t-5 through t-1.

*SDI* = Standard deviation of investment for the time period of t-5 through t-1.
*TNGBTY* = Property, plant and equipment divided by average total assets.

*KSTR* = Long-term debt divided by the sum of long-term debt and the market value of common stock.

*MKSTR* = Average KSTR of firms within the same 3-digit SIC industry.

*OPCY* = Log of receivables divided by sales plus inventory divided by cost of goods sold, multiplied by 360.

*DVDS* = Indicator variable set equal to one if dividends are paid, zero otherwise.

**Variables Used In Additional Analyses:**

*AQ* = Standard deviation of company-level residuals from the McNichols (2002) modification of the Dechow and Dichev (2002) model during the years of t-5 through t-1, multiplied by a negative one. I estimate the model cross-sectionally for each industry with at least 10 observations in a given year based on the Fama and French (1997) 48-industry classification.

*INSTIT* = Percentage of firm shares held by institutional investors.

*ANLYT* = Number of analysts following the firm as provided by IBES.

*IG_SCORE* = Gompers et al. (2003) measure of governance, multiplied by a negative one.

*G_SCORE* = Gompers et al. (2003) measure of governance.

| | | |
|---|---|---|
| *DG_SCORE* | = | Indicator variable that takes the value of one if the G_SCORE is missing, and zero otherwise. |
| *LGASST* | = | Log of total assets. |
| *Z_SC* | = | Measured as the bankruptcy index developed by Altman (1968). |
| *IE* | = | Ranked variable based on the average of the decile ranked measures of cash and leverage. Leverage is multiplied by negative one before ranking so that both variables are increasing in the likelihood of over-investments. This measure is then normalized to a value of between 0 and 1. |
| *MB* | = | Ratio of market value of total assets to book value of total assets. |
| *REST* | = | Aggregate restructuring charges in year t and year t-1, scaled by the firm's market capitalization. |

# Appendix B: AHP Applied to Internal Control

## B.1 Introduction

Firm specific internal control information has recently been collected and is now available as a result of the passage of SOX. However, a suitable metric to measure an organization's internal control has not yet been developed. The absence of an internal control metric is in part due to the differing internal control system priorities of the various stakeholders (e.g. managers, auditors, analysts). Recent internal control research and guidance recognizes that differences in severity among the types of MW that are reported exist. For example, Doyle et al. (2007a, 2007b) find that firms reporting entity-level MW suffer from lower accruals quality, are smaller, younger, and have lower financial stability than firms that report account specific MW. However, research moved beyond the dual categorization employed by Doyle et al. (2007a, 2007b) and the examination of the impact of different MW types individually (Feng et al. 2010; Li et al. 2012; Gordon and Wilford 2012).

This study seeks to provide insight into a potential method for ranking firms based on the categorization of MW that is provided through the Audit Analytics database.[16] The Audit Analytics categorization of MW has been used extensively to examine the effects of MW on decisions and firm performance. However, an extensive evaluation and ranking of firms based on the specific types of reported MW has not yet been conducted.

[16] Audit Analytics is an information service provider that compiles SOX Section 302 and SOX Section 404 internal control information by firm.

The major objectives of this study are (1) to provide insight into stakeholder perceptions of specific categories of MW and (2) to provide guidance to decision makers as they work toward implementing strong internal control systems within their respective organizations. Additionally, the implications of this study may help policy makers as they evaluate how to appropriately implement policies that will improve the overall internal control environment within firms. The underlying methodology to be used in this study is the Analytic Hierarchy Process (hereafter, AHP).

## B.2 The Analytic Hierarchy Process

AHP, developed by Thomas L. Saaty in the 1970s (Saaty 1980, 1986), combines different methods from mathematics and psychology to aid in complex multiple criteria decision-making. More specifically, AHP is a tool that can be used to rank alternatives based on determining the appropriate weights to assign to the qualitative and quantitative criteria and sub-criteria defined within the problem under consideration.

The four major steps in the AHP are the following:

- Step 1: Establish the hierarchy by drawing the AHP tree.
- Step 2: Have participants evaluate the criteria and sub-criteria in the AHP tree hierarchy using pairwise comparisons.
- Step 3: Evaluate participant responses using pairwise comparison matrices generated in Step 2.
- Step 4: Synthesize the results with respect to the overall goal.

These four major steps are now discussed.

### B.2.1 Step 1: Establish the Hierarchy

Establishing the hierarchy in Step 1 begins with defining the overall goal of the problem, determining the primary criteria to be considered within the decision making process, further refining the primary criteria into sub-criteria, sub-sub-criteria, etc. and drawing the AHP tree. In the AHP tree, the primary criteria are connected to the goal node, the sub-criteria are connected to the corresponding criteria, etc. Examples of AHP trees are given throughout this Appendix.

An AHP model needs to capture all of the important criteria and sub-criteria, but remain small enough that it can be manageable. The two versions of AHP model analysis are the Direct Comparison Model (described in Section B.2.1a) and the Ratings Model (described in Section B.2.1b). The process for analyzing a problem is a function of which version of the AHP model is used.

#### B.2.1.1 The Direct Comparison AHP Model

Within the Direct Comparison AHP model, the criteria and sub-criteria are established and linked to the alternatives that are investigated within the decision making process. A simple example of the AHP tree for the Direct Comparison Model is shown as Figure B1 on page 115. The primary result of the Direct Comparison Model is a ranking of the alternatives from best to worst by determining the weight between 0 and 1 to assign to each of the alternatives where the sum of the weights over all of the alternatives must equal 1. For example, a solution to the problem represented by the AHP tree in Figure B1 (page 115) may have a weight of 0.60 assigned to Alternative 1 and a weight of 0.40 assigned to Alternative 2. Thus, Alternative 1 would be considered superior within this analysis.

#### B.2.1.2 The Ratings AHP Model

A second version of the AHP is the Ratings Model. In this case, the sub-criteria weights can be replaced by a measure called intensities. The AHP tree for the Ratings Model is displayed in Figure B2a on page 116. Figure B2b, page 116, outlines the AHP tree in spreadsheet form for ease of calculation in deciding between alternatives. With the spreadsheet form, the alternatives are placed into a spreadsheet and scored based on the weights found for the criteria and sub-criteria (or intensities) using the pairwise comparisons. The alternatives are sorted from best to worst by the overall score found in the spreadsheet. This overall score denotes how close each alternative is to perfection where perfection is an overall score of 1. The Ratings Model is used in the analysis that follows.

### B.2.2 Step 2: Have Participants Evaluate Hierarchy Elements Using Pairwise Comparisons

As alluded to previously in this Appendix, the pairwise comparisons are a key component of the AHP and are used to supply the data for carrying out the analysis. The pairwise comparisons allow participants to compare the relative importance of criteria and sub-criteria two at a time rather than all at once. Comparing all criteria or sub-criteria at the same time can be a nearly insurmountable task because of the complexity of the decisions.

A pairwise comparison analysis can be handled in a non-complex setting (Saaty 1980). Participants use a top-down approach to compare criteria. Within each pairwise comparison, participants assign a numerical value, based on a 1 to 9 scale, as their evaluation of the more important criterion/sub-criterion to the less important

criterion/sub-criterion (Saaty 1980). A chart representing the ratings scale used within AHP analysis is provided in Figure B3 on page 117.

The pairwise comparisons represent a ratio of the weights assigned to the two criteria that are being compared. For example, if Criterion A is moderately more preferred than Criterion B, then, according to the pairwise comparison scale (in Figure B3), the participant assigns a value of 3 when comparing Criterion A to Criterion B and a value of 1/3 when comparing Criterion B to Criterion A. More generally, if the pairwise comparison for A to B is equal to w, then the pairwise comparison of B to A = 1/w.

### B.2.3 Step 3: Evaluate the Participant Responses Using the Pairwise Comparison Matrices Generated in Step 2

In Step 3, the participant responses are evaluated to determine the weights assigned to the various criteria and sub-criteria. To determine these weights, all pairwise comparisons (i.e., judgments) made by the participants in Step 2 are stored in pairwise comparison matrices. As noted in Step 2, the pairwise comparison matrix $A = (a_{ij})$ is a positive reciprocal matrix (i.e. in the pairwise comparison matrix, $a_{ji} = 1/a_{ij}$). Thus, the comparison of Criterion i to Criterion j will always be the reciprocal of the comparison of Criterion j to Criterion i. These pairwise comparison matrices are then used to determine the weights assigned to each criterion and sub-criterion. Then, the eigenvector associated with the maximum eigenvalue of a pairwise comparison matrix determines the weights assigned to the criteria or sub-criteria associated with the pairwise comparison matrix.

### B.2.4 Step 4: Synthesize the Results with Respect to the Overall Goal.

Synthesizing the results for the Direct Comparison AHP Model is different than synthesizing the results for the Ratings Model. These two processes are discussed in Sections B.2.4a and B.2.4b.

#### B.2.4.1 Synthesizing the Results for the Direct Comparison Model

The fourth and final step in the Direct Comparison AHP is to determine the total weight to be assigned to each alternative. For the purpose of this example, I have assigned weights to the criteria and sub-criteria from Figure B1 to produce Figure B4a, page 118. These weights, along with a symbol representing each criterion and sub-criterion are given within each block in Figure B4a.

The sum of criteria weights must equal one, the sum of the sub-criteria weights below each criterion must also be equal to one, and the sum of the alternative weights for each sub-criterion must equal 1. Then, to synthesize the results within the Direct Comparison AHP, the paths from each goal down to the alternatives are traced, the weights are multiplied along each path and these quantities are added together. This process leads to the final result illustrated in Figure B4b. Since Alternative 1 yields a higher value Alternative 1 (Alt1) is preferred to Alternative 2 (Alt 2). The evaluation of Alt1 is 0.525 and the evaluation of Alt2 is 0.475. These computations are shown in Figure B4b, page 118.

#### B.2.4.2 Synthesizing the Results for the Ratings Model

As discussed above, the Ratings AHP model differs from the Direct Comparison Model in that alternatives are scored based on the intensities and the rating of the sub-criteria. For the purpose of this example, I have assigned values to the criteria and sub-criteria from Figure B2 to produce Figure B5, page 119. The sum of criteria values must equal one and the sum of the sub-criteria values below each criterion must be equal to one.

For our current example, I will assume that each alternative either has the listed sub-criterion, or does not. As such, Alternative 1 is assigned a value of 0 or 1 for each of the sub-criteria it possesses. This evaluation technique mirrors the way the Audit Analytics database is constructed, a 0 indicates the MW is not present and a 1 indicates the MW is present. Tracing the paths from each goal down to the alternatives, multiplying the weights along the paths and subsequently adding the weights together leads to the final result (as shown below in Figure B5). Thus, if a higher score is equivalent to the better alternative, Alternative 1 would be selected. As stated earlier the score for any alternative is no greater than one.

## B.3 Motivation

### B.3.1 The Use of AHP in Accounting Research

AHP has been used within accounting research as a tool to examine evaluation and planning decisions. Using AHP to model auditing procedure preferences, Arrington et al. (1984) provided one of the first applications of AHP within accounting research. Additionally, Arrington et al. (1984) suggest AHP as an applicable procedure for making "judgments such as materiality, internal control evaluation, opinion qualifications, and strategic planning" (Arrington et al. 1984, 309). Other applications of the AHP in accounting include examining auditors' evaluations of internal audit functions (Messier and Schneider, 1988; Campbell, 1994), tests of controls (Spires 1991), audit planning (Bedard et al. 1991), performance evaluation (Emby and Etherington 1996), accounting treatment (Boyle 1985), and information security investments (Bodin et al. 2005, 2008).

### B.3.2 Categorization of MW Within Prior Literature

Under Section 404 of the Sarbanes-Oxley Act of 2002 (SOX), firm management is required to state responsibility for and provide an assessment of internal control. Subsequently, a firm's auditors are required to attest to and report on management's assessment (US House of Representatives 2002) of internal control. The SEC, PCAOB, and various private and investor service companies have produced guidance and rulings in response to SOX (SEC 2003, PCAOB 2007, Doss and Jonas 2004). This renewed focus on internal control came in response to what was perceived to be a lack of internal controls within the scandal-ridden companies of the early 2000s (e.g., Enron, TYCO, WorldCom, etc.). With the renewed focus and availability of information provided through SOX, researchers have used MW as a backdrop to examine issues affecting the firm, auditors, and investors (e.g. Doyle et al. 2007a, Beneish et al. 2008, Early et al. 2008, Wolfe et al. 2009, Rose et al. 2010).

Prior research has generally examined internal control based on a two-category classification, entity-level controls and account-specific controls. Entity-level controls are company-level controls that encompass the control environment and the financial reporting process. Account-specific controls are controls over specific financial statement accounts and are clearly related to transaction-level processes.

Entity-level controls can range from controls related to the control environment to management tone and external communication and may be more difficult to attach to the financial reporting process. Account-specific controls, on the other hand, are clearly related to financial reporting (e.g. inadequate processes related to accounting for foreign transaction adjustments, lack of reconciliation processes, etc.). The distinct differences

between these two categories of internal control have been recognized over the past three decades (Kinney 1989; Messier and Austen 2000; PCAOB 2007). Because of the difficulty auditing around entity-level controls, the PCAOB and Moody's Investors Services have both emphasized the importance of understanding controls within this category (PCAOB 2007; Doss and Jonas 2004).

Researchers have recognized the importance of the categorization of internal control and have included designations of account-specific and entity-level controls within their research in examining the effects of poor internal control upon firm characteristics (Ge and McVay 2005; Doyle et al. 2007a), firm performance (Beneish et al. 2008; Gordon and Wilford 2012), earnings quality (Doyle et al. 2007b and Chan et al. 2008) audit fees (Elder 2009), audit delay (Ettredge 2006), and investor risk adjustment (Rose et al. 2010). Since field auditors are the first-line decision makers in the initial internal control assessment, they play a crucial role in the Section 404 assessment process. Research has shown a more significant negative effect on cost of equity is associated with reporting entity-level MW (Ashbaugh-Skaife et al. 2009) and the higher the number of MW reported the higher the cost of equity (Gordon and Wilford 2012). Additionally, investors increase their investment risk assessments to a greater degree when entity-level MW are reported versus account-specific MW (Rose et al. 2010).

Although auditor attestation is a significant component of SOX Section 404 and audited financial statements in general, it is unclear whether a difference in auditor perception exists between entity-level MW and account-specific MW. Research has shown that firms report fewer entity-level MW than account-specific MW (Doyle et al. 2007a; Beneish et al. 2008). The PCAOB has issued Auditing Standard No. 5 (AS5) and

this standard stipulates a top-down approach, based upon first examining a firm's entity-level controls and then moving down to an examination of the process-level (account-specific) controls, should be used in the integrated audit of financial statements and internal control. This approach is based upon an understanding of the difficulty in auditing around MW in entity-level controls, based on their pervasive nature, and is recognized by both the PCAOB and industry (PCAOB 2007, Doss and Jonas 2004).

### B.4 Overview of Model Using AHP to Examine Internal Control Systems

To date, AHP has not as yet been applied as a tool for evaluating various types of weaknesses in internal control systems. Prior to the passage of SOX, firm specific internal control information was not publicly available. However, firms with MW are now required to list their MW within their quarterly and annual reports. This requirement has allowed companies to gather this information into a database format that can be accessed by practitioners and researchers alike. As a database provider, Audit Analytics has classified the MW reported by firms into different categories.

The current study will seek to establish a metric of internal control strength among firms that have reported MW. To test the robustness of the developed metric to prior results, I will examine how the AHP developed internal control system metric relates to firm performance. In Section B.5, I describe the AHP Model Design for the analysis in this dissertation.

### B.5 AHP Model Design

In this section, I describe the AHP model design for the subsequent analyses that I will perform. The goal of this analysis is to develop a metric for determining or measuring the internal control system strength of an organization.

### B.5.1 Establishing the Hierarchy

Audit Analytics classifies each firm's reported MW into twenty-one categories. If each of these categories of MW were classified as a primary criterion, decision makers would analyze (21*20)/2 = 210 pairwise comparisons. To ease this difficulty, the twenty-one categories of MW are broken down into five major criteria areas where each of the twenty-one MW is categorized into each of these five major criteria areas. The five major criteria established are the following:

- Personnel Weaknesses.
- Financing/Accounting Reporting Issues.
- Policy Issues.
- Restatements/Adjustments.
- Regulatory Issues.

A diagram of the hierarchy (or AHP tree) for the model I am developing is given in Figure B6, page 120. This initial hierarchy has been presented to two accounting professionals and the review of the structure yielded no significant modifications to the hierarchy. In this AHP tree, there are abbreviations representing each of the five criteria and twenty-one sub-criteria. The abbreviations are used to more easily present the results.

### B.5.2 Pairwise Comparison Matrices

Given that there are five criteria and each of these criteria is composed of different sub-criteria, there are six pairwise comparison matrices. The six pairwise comparison matrices that each decision maker must fill in according to the pairwise comparisons of the different criteria and sub-criteria are based on the five criteria. Each of the six pairwise comparison matrices is described below.

### B.5.2.1 Internal Control Weaknesses Pairwise Comparison Matrix

The Internal Control Weaknesses Pairwise Comparison Matrix is a 5x5 matrix and represents the Goal Node of the AHP tree. The rows and columns in the Internal Control Weaknesses Pairwise Comparison Matrix are the following:

- Personnel Weaknesses (PW).
- Financing/Accounting Reporting Issues (FRI).
- Policy Issues (PI)
- Restatements/Adjustments (R/A).
- Regulatory Issues (RI).

The pairwise comparison matrix takes the following form:

| | | **To Criterion** | | | | |
|---|---|---|---|---|---|---|
| | | ***PW*** | ***FRI*** | ***PI*** | ***R/A*** | ***RI*** |
| **From Criterion** | ***PW*** | 1 | $\mathbf{A_{12}}$ | $\mathbf{A_{13}}$ | $\mathbf{A_{14}}$ | $\mathbf{A_{15}}$ |
| | ***FRI*** | $1/A_{12}$ | 1 | $\mathbf{A_{23}}$ | $\mathbf{A_{24}}$ | $\mathbf{A_{25}}$ |
| | ***PI*** | $1/A_{13}$ | $1/A_{23}$ | 1 | $\mathbf{A_{34}}$ | $\mathbf{A_{35}}$ |
| | ***R/A*** | $1/A_{14}$ | $1/A_{24}$ | $1/A_{34}$ | 1 | $\mathbf{A_{45}}$ |
| | ***RI*** | $1/A_{15}$ | $1/A_{25}$ | $1/A_{35}$ | $1/A_{45}$ | 1 |

The pairwise comparisons ($A_{12}$, $A_{13}$, . . , $A_{45}$) denoted in bold in the pairwise comparison matrix of this section are filled in by the decision maker. The pairwise comparisons denoted in italics are computed by the AHP. The diagonal elements of this matrix are 1 because a criterion is being compared to itself. The overall matrix is a reciprocal matrix as $A_{ji}= 1/A_{ij}$ for i=1, 2, . . . , 5, j= 2, . . . , 5, i < j.

### B.5.2.2 Personnel Weaknesses Pairwise Comparison Matrix

Personnel Weaknesses is one of the criterion nodes of the AHP tree. The Personnel Weaknesses Pairwise Comparison Matrix is a 5x5 matrix, as there are five sub-criterion under the Personnel Weaknesses criterion in the AHP tree in Figure B6. The

rows and columns in the Personnel Weaknesses Pairwise Comparison Matrix are the following:

- Accounting personnel resources, competency/training (ACT).
- Ethical compliance issues with personnel (ECI).
- Senior management competency, tone, reliability issues (SMI)
- Insufficient or non-existent audit function (INI).
- Segregations of duties/design of control (personnel) (SD).

The pairwise comparison matrix takes the following form:

| | | **To Criterion** | | | | |
|---|---|---|---|---|---|---|
| | | ***ACT*** | ***ECI*** | ***SMI*** | ***INI*** | ***SD*** |
| **From Criterion** | ***ACT*** | 1 | $\mathbf{B_{12}}$ | $\mathbf{B_{13}}$ | $\mathbf{B_{14}}$ | $\mathbf{B_{15}}$ |
| | ***ECI*** | $1/B_{12}$ | 1 | $\mathbf{B_{23}}$ | $\mathbf{B_{24}}$ | $\mathbf{B_{25}}$ |
| | ***SMI*** | $1/B_{13}$ | $1/B_{23}$ | 1 | $\mathbf{B_{34}}$ | $\mathbf{B_{35}}$ |
| | ***SD*** | $1/B_{14}$ | $1/B_{24}$ | $1/B_{34}$ | 1 | $\mathbf{B_{45}}$ |
| | ***IAC*** | $1/B_{15}$ | $1/B_{25}$ | $1/B_{35}$ | $1/B_{45}$ | 1 |

The pairwise comparisons ($B_{12}$, $B_{13}$, . . . , $B_{45}$) denoted in bold in the pairwise comparison matrix are filled in by the decision maker. The pairwise comparisons denoted in italics are computed by the AHP. The diagonal elements of this matrix are 1 because a criterion is being compared to itself. The overall matrix is a reciprocal matrix as $A_{ji}= 1/A_{ij}$ for i=1, 2, . . . , 5, j= 2, . . . , 5 , i < j.

**B.5.2.3 Financing/Accounting Reporting Issues Pairwise Comparison Matrix**

Financing/Accounting Reporting Issues is one of the criterion nodes of the AHP tree. The Financing/Accounting Reporting Issues Pairwise Comparison Matrix is a 5x5 matrix, as there are five sub-criterion under the Financing/Accounting Reporting Issues criterion in the AHP tree in Figure B6. The rows and columns in the Financing/ Accounting Reporting Issues Pairwise Comparison Matrix are the following:

- Treasury control issues (TC).
- Journal entry control issues (JEC).
- Non-routine transaction control issues (NTC)
- Inadequate disclosure controls (ID).
- Material and/or numerous auditor/YE adjustments (MA).

The pairwise comparison matrix takes the following form:

| | | **To Criterion** | | | | |
|---|---|---|---|---|---|---|
| | | ***TC*** | ***JEC*** | ***NTC*** | ***ID*** | ***MA*** |
| **From Criterion** | ***TC*** | 1 | $\mathbf{C_{12}}$ | $\mathbf{C_{13}}$ | $\mathbf{C_{14}}$ | $\mathbf{C_{15}}$ |
| | ***JEC*** | $1/C_{12}$ | 1 | $\mathbf{C_{23}}$ | $\mathbf{C_{24}}$ | $\mathbf{C_{25}}$ |
| | ***NTC*** | $1/C_{13}$ | $1/C_{23}$ | 1 | $\mathbf{C_{34}}$ | $\mathbf{C_{35}}$ |
| | ***ID*** | $1/C_{14}$ | $1/C_{24}$ | $1/C_{34}$ | 1 | $\mathbf{C_{45}}$ |
| | ***MA*** | $1/C_{15}$ | $1/C_{25}$ | $1/C_{35}$ | $1/C_{45}$ | 1 |

The pairwise comparisons ($C_{12}$, $C_{13}$, . . . , $C_{45}$) denoted in bold in the pairwise comparison matrix are filled in by the decision maker. The pairwise comparisons denoted in italics are computed by the AHP. The diagonal elements of this matrix are 1 because a criterion is being compared to itself. The overall matrix is a reciprocal matrix as $A_{ji}= 1/A_{ij}$ for i=1, 2, . . . , 5, j= 2, . . . , 5, i < j.

**B.5.2.4 Policy Issues Pairwise Comparison Matrix**

Policy Issues is one of the criterion nodes of the AHP tree. The Policy Issues Pairwise Comparison Matrix is a 3x3 matrix as there are three sub-criterion under the Policy Issues criterion in the AHP tree in Figure B6. The rows and columns in the Policy Issues Pairwise Comparison Matrix are the following:

- Untimely or inadequate account reconciliation (UAR).
- Accounting documentation, policy and/or procedure (ADP).

- Information technology software, security and access issues (IT)

The pairwise comparison matrix takes the following form:

| | | **To Criterion** | | |
|---|---|---|---|---|
| | | ***UAR*** | ***ADP*** | ***IT*** |
| **From Criterion** | ***UAR*** | 1 | $\mathbf{D_{12}}$ | $\mathbf{D_{13}}$ |
| | ***ADP*** | $1/D_{12}$ | 1 | $\mathbf{D_{23}}$ |
| | ***IT*** | $1/D_{13}$ | $1/D_{23}$ | 1 |

The pairwise comparisons ($D_{12}$, $D_{13}$, $D_{23}$) denoted in bold in the pairwise comparison matrix are filled in by the decision maker. The pairwise comparisons denoted in italics are computed by the AHP. The diagonal elements of this matrix are 1 because a criterion is being compared to itself. The overall matrix is a reciprocal matrix as $A_{ji}= 1/A_{ij}$ for i=1, 2, 3, j = 2, 3, i < j.

**B.5.2.5 Restatements/Adjustments Pairwise Comparison Matrix**

Restatements/Adjustments is one of the criterion nodes of the AHP tree. The Restatements/Adjustments Pairwise Comparison Matrix is a 3x3 matrix as there are three sub-criterion under the Restatements/Adjustments criterion in the AHP tree in Figure B6. The rows and columns in the Restatements/Adjustments Pairwise Comparison Matrix are the following:

- Restatement or non-reliance of company filings (RNF).
- Restatement of previous 404 disclosures (RPD).
- SAB 108 adjustments noted (SAB)

The pairwise comparison matrix takes the following form:

| | | To Criterion | | |
|---|---|---|---|---|
| | | ***RNF*** | ***RPD*** | ***SAB*** |
| **From Criterion** | ***RNF*** | 1 | $\mathbf{E_{12}}$ | $\mathbf{E_{13}}$ |
| | ***RPD*** | $1/E_{12}$ | 1 | $\mathbf{E_{23}}$ |
| | ***SAB*** | $1/E_{13}$ | $1/E_{23}$ | 1 |

The pairwise comparisons ($E_{12}$, $E_{13}$, $E_{23}$) denoted in bold in the pairwise comparison matrix are filled in by the decision maker. The pairwise comparisons denoted in italics are computed by the AHP. The diagonal elements of this matrix are 1 because a criterion is being compared to itself. The overall matrix is a reciprocal matrix as $A_{ji}= 1/A_{ij}$ for i = 1, 2, 3, j = 2, 3, i < j.

### B.5.2.6 Regulatory Issues Pairwise Comparison Matrix

Regulatory Issues is one of the criterion nodes of the AHP tree. The Regulatory Issues Pairwise Comparison Matrix is a 5x5 matrix as there are five sub-criterion under the Regulatory Issues criterion in the AHP tree in Figure B6. The rows and columns in the Regulatory Issues Pairwise Comparison Matrix are the following:

- Ineffective or understaffed audit committee (IUA).
- Ineffective regulatory compliance issues (IRC).
- Management/Board/Audit Committee investigations (MI)
- SEC or other regulatory investigations and/or inquiries (SI).
- Scope/disclaimer of opinion or other limitations (SDL).

The pairwise comparison matrix takes the following form:

| | | To Criterion | | | | |
|---|---|---|---|---|---|---|
| | | ***IUA*** | ***IRC*** | ***MI*** | ***SI*** | ***SDL*** |
| **From Criterion** | ***IUA*** | 1 | $\mathbf{F_{12}}$ | $\mathbf{F_{13}}$ | $\mathbf{F_{14}}$ | $\mathbf{F_{15}}$ |
| | ***IRC*** | $1/F_{12}$ | 1 | $\mathbf{F_{23}}$ | $\mathbf{F_{24}}$ | $\mathbf{F_{25}}$ |
| | ***MI*** | $1/F_{13}$ | $1/F_{23}$ | 1 | $\mathbf{F_{34}}$ | $\mathbf{F_{35}}$ |
| | ***SI*** | $1/F_{14}$ | $1/F_{24}$ | $1/F_{34}$ | 1 | $\mathbf{F_{45}}$ |
| | ***SDLI*** | $1/F_{15}$ | $1/F_{25}$ | $1/F_{35}$ | $1/F_{45}$ | 1 |

The pairwise comparisons ($F_{12}$, $F_{13}$, . . . , $F_{45}$) denoted in bold in the pairwise comparison matrix are filled in by the decision maker. The pairwise comparisons denoted in italics are computed by the AHP. The diagonal elements of this matrix are 1 because a criterion is being compared to itself. The overall matrix is a reciprocal matrix as $A_{ji} = 1/A_{ij}$ for i = 1, 2, . . . , 5, j = 2, . . . , 5, i < j.

### B.5.3 Deriving the Pairwise Comparisons for each Pairwise Comparison Matrix

After the hierarchy was established, I formulated a questionnaire to be distributed to participants of the study. The questionnaire outlines each pairwise comparison that the user must complete and provides, as a supplement, the ratio scale table given in Figure B3 to remind the user of the scale that should be used to interpretation of the pairwise comparisons. An example of a pairwise comparison decision used in the questionnaire is presented as Figure B7, page 121.

A participant presented with the example in Figure B7 would first determine which issue is more severe. For example, if the participant thinks that Personnel Weaknesses have a greater impact on the financial statements than Financing/Accounting Reporting Weaknesses, he/she would select A in the first part of the question shown in Figure B7. In the second part of the question, the participant would indicate how much greater of an impact Personnel Weaknesses would have on the financial statements, using the Pairwise Comparison Scale.

### B.5.4 Experiment Design

The participants of the study are broken down into three different groups: (1) auditors, (2) financial analysts, and (3) managers. Although auditors and reporting

agencies have touted the importance of internal control to the organization, it is not clear that managers and financial analysts value the same aspects of internal control. An objective of this analysis is to determine the relative importance the auditors, financial analysts and managers place on the twenty-one sub-criteria. Including individuals from all three groups will enable the priorities of all stakeholders to be included within the final and I will ascertain the different priorities of the members of the three groups.

Potential participants were randomly selected from a social network. I then categorized participants into one of the three different groups. The initial list of potential participants included seven auditors, seven financial analysts, and seven managers over financial reporting. Each potential participant was then emailed a link to an online questionnaire. At the end of the survey period, 18 individuals completed the questionnaire. These 18 participants consisted of seven auditors, four financial analysts and seven managers over financial reporting. Each participant had at least seven years of experience. All seven auditors that completed the survey are at least audit managers within one of the Big 4 accounting firms. The seven managers that completed the survey all have duties specifically related to the preparation of the financial statements and work for publicly traded organizations. The four financial analysts are senior level personnel within their respective publicly traded organizations and their duties involve examining the financial statements of other organizations to establish recommendations for procurement activities.

Each individual completed the online questionnaire (formulated along the lines of Figure B7 above). I used these results to set up the pairwise comparisons of the criteria MW categories and the sub-criteria MW categories for each participant. Pairwise

comparison matrices for the criteria and sub-criteria were formulated for each individual, each group, the participants from the auditor and manager groups, and all participants. These individual, group, and combined participant pairwise comparison matrices are then used to obtain the weights that are assigned to each MW category.

Following the calculation of the weights, an internal control score for each firm is determined. The score for each firm is determined by the weights for each group and group combination. The procedure used for determining these scores follows the processes used in the ratings model version of the AHP. I will now describe this process in more detail.

### B.5.5 Illustration of Weight Computation

The weights assigned to each of the criteria and sub-criteria by group are determined using the mathematical models underlying the AHP. This is a standard analysis and has been described in numerous applications. With the completed pairwise comparisons, I use an excel spreadsheet to determine the weights that I assign to each criteria and sub-criteria for each participant. The pairwise comparison matrix and the calculation of the weights for Auditor 1 is shown in Figure B8, page 122.

The top third of the Figure B8 displays the pairwise comparison matrix for Auditor 1's criteria category. The pairwise comparisons made by the participant are entered into the highlighted area of the table and the reciprocals are then calculated in the bottom half of the table. To calculate the weights to be assigned to each criteria and sub-criteria, three steps are performed. First, I divide each element in the pairwise comparison matrix by the sum of all the elements in its column. The results of this first step are displayed as the middle section of Figure B8. As a second and final step, the rows

displayed as the middle portion of Figure B8 are summed and then divided by the number of criteria (in this case 5). The resulting weights are then displayed as the bottom third of Figure B8. This figure indicates that Auditor 1 assigns a weight of 0.1519 to the Personnel Weakness criterion, etc.

**B.5.6 Analysis of Consistency**

In addition to calculating the weights for each of the criteria and sub-criteria for each individual, I check the consistency of the judgments made by each individual. A formula developed by Saaty (1980) calculates the consistency of the pairwise comparison matrix through the following formula:

$$C.I. = \left( \frac{\lambda_{\max} - n}{n-1} \right) / C.R.$$

where:

| | | |
|---|---|---|
| $\lambda_{\max}$ | = | Average(Aω/ω) |
| A | = | Matrix of pairwise comparisons |
| ω | = | Vector of weights |
| C.R. | = | Consistency Ratio, determined by calculating the consistency index from a large samples of purely random judgments. The values associated with this variable are derived from Saaty (1980). For purposes of my analysis, C.R. is set equal to 1.12 for the 5x5 matrices and set equal to 0.58 for the 3x3 matrices. |
| C.I. | = | Consistency Index |

Saaty (1980) argued that reliable judgments had Consistency Indexes of less than 0.10. After I had calculated the weights for all the criteria and sub-criteria, I applied the above consistency check to each pairwise comparison matrix. The results of this first pass suggest that there was a lack of consistency within some of the participant's judgments.

Consistency Indexes for all individuals ranged between 0.00 (completely consistent) to 0.57 (highly inconsistent) for all matrices. Given the online nature of the AHP questionnaire environment, I examined each of the pairwise judgments and emulated the results that would have been the product of a group discussion that is generally associated with AHP. This additional step ensured consistency within each participant's pairwise comparison matrices (i.e., C.I. was less than 0.10 for all matrices).

Inconsistencies among some of the judgments could be due to a couple of different factors. First, a limited understanding about the AHP environment could be a factor that adversely impacted consistency. Had the judgments been made within a controlled group environment, this problem would have been eliminated. Second, limited AHP training can lead to difficulty in visualizing the relationship between all of the judgments. To ensure that the integrity of the weights were maintained, any adjustments that were made to the pairwise comparisons were based off of the judgments made with respect to the first variable. I compared the weights associated with each matrix before and after the judgments were revised and any differences in weights were insignificant, irrespective of the changes in consistency.

### B.5.7 Group Analyses and Computational Results

After the pairwise comparison matrices, their associated weights, and the measure of consistency have been established for each individual, I combine the individual results by group and establish group pairwise comparison matrices that are used to determine the weights assigned to the criteria and sub-criteria for each group. Each element in the group's pairwise comparison matrices is determined based on the geometric average of that element for all participants in the group. The geometric average is the n'th root of the

product of the each element for each participant. In addition to computing the weights for each of the groups, I compute a set of combined groups based two combinations of participants (1) all auditor and manager participants and (2) all participants. The results of the group computations are shown as Figure B9, page 123. I calculated the consistency index for each of the three groups and the combined groups. The consistency indexes ranged from 0.001 to 0.01, all well below the required 0.10.[17]

### B.6 Results

In addition to developing an internal control metric that can be used to rank firms that have reported MW, this study seeks to gain a greater understanding of the differences between the MW perceptions of various financial statement stakeholders. Given the breadth of this study, the analysis of the results obtained through AHP is exploratory in nature. In the results sections that follow, I provide a high level overview of the AHP results and includes a summary of the main results, with respect to how the participants feel that different categories and types of MW impact the financial statements.

#### B.6.1 Criteria Results

The results of the AHP (Figure B9) provide some interesting insights into the perceptions of the different groups with respect to how the different types of MW impact the financial statements. The criteria weights in Figure B9 indicate the level of impact that each of the criteria have on the financial statements compared to the other criteria. These criteria weights indicate that managers feel that PW have the greatest impact on the financial statements, with 50.1 percent of the weight being attached to this criterion. Auditors also feel that PW have the greatest impact (28.9 percent) on the financial

[17] Consistency for the groups prior to the individual pairwise adjustments ranged from 0.01 to 0.03, still well below the required 0.10.

statements. However, the auditors also feel that FRI and PI have a significant impact on the financial statements (23.7 percent and 24.6 percent, respectively). The financial analysts feel all criteria groups have approximately the same impact on the financial statements with the exception of R/A, which is weighted as having a significantly lower financial statement impact (7.6 percent).

### B.6.2 Manager Sub-criteria Results

The sub-criteria weights indicate the level of impact that each of the sub-criteria (types of MW) have on the financial statements compared to the other sub-criteria. These results indicate that the managers find that with respect to the PW category MW, SMI and ECI have the greatest impact on the financial statements (36.7 percent and 26.9 percent, respectively). Managers find that FRI issues are not as clear-cut and three types of MW are each considered as having the greatest impact on the financial statements, MA (27.9 percent), NTC (24.6 percent), and JEC (22.4 percent). Managers view IT as having the greatest financial statement impact (41.4 percent) within the PI criteria category. The manager participants indicated that RNF and SAB, within the R/A category, have an equally significant impact on the financial statements (39.5 percent and 38.2 percent, respectively). Finally, the manager participants indicate that within the RI criteria category, SI MW have the greatest impact (31.9 percent) on the financial statements.

### B.6.3 Auditor Sub-criteria Results

The auditor participants indicate that with respect to the PW category, the SMI MW have the greatest impact on the financial statements (36.4 percent). The auditor participants clearly indicate that JEC and MA MW have the greatest impact on the financial statements (28.4 percent and 25.0 percent, respectively), within the FRI criteria

category. Where as manager participants found IT to have the greatest impact on the financial statements, auditor participants indicated that within the PI category, ADP MW have the greatest impact on the financial statements (45.4 percent). The auditor participants indicated that RNF MW have a significantly greater impact (58.3 percent) on the financial statements than the other types of MW in the R/A category. Finally, the auditor participants conclude that within the RI criteria category, SDL, MI, and SI MW have the greatest impact (27.9 percent, 27.4 percent, and 24.5 percent, respectively) on the financial statements.

### B.6.4 Financial Analyst Sub-criteria Results

The financial analyst participants rate the MW (sub-criteria) within the PW and FRI criteria categories as having a fairly equal impact on the financial statements, there are no types of MW that tend to rise above the rest within these categories. However, ADP MW within the PI criteria category are clearly viewed by this group as having a greater impact on the financial statements (55.6 percent) than the other types of MW within this category. The SAB and RNF MW sub-criteria categories are both viewed as having a significant impact on the financial statements (42.3 percent and 38.7 percent, respectively) within the financial analyst's R/A category. Finally, financial analyst participants indicate that SI MW have the greatest impact on the financial statements within the RI category.

## B.7 The Ratings Model – Applying the Weights to the Audit Analytics Data

The final weights that are applied to each sub-criteria are determined by multiplying the weights the criteria and their associated sub-criteria together. For example, the weight that would be applied to sub-criteria ACT, for the manager group, is

calculated as the weight of PW (0.510) multiplied by the weight of ACT (0.165). The weight that results from this multiplication is 0.084 and this is the weight that will be applied to the ACT MW that are reported by each company.

The Audit Analytics database defines the specific types of MW reported by each firm that has to comply with SOX. I use an indicator variable for each specific type of MW that is reported by each firm. This indicator variable is set equal to one if the company reported an internal control failure for this subcategory in the AHP tree and zero otherwise. The specific types of MW are listed as the sub-criteria in Figure B9.

An internal control metric for each group and combination of participants is calculated using the weights identified above multiplied by the MW type indicator variables for each firm that reports MW. For example, I would calculate the manager group internal control metric (*ICI_MAN*) for a firm that reports Senior management competency, tone, reliability issues (SMI) and Accounting documentation, policy and/or procedure issues (ADP) as follows:

ICI_MAN = SMI(0.187) + ADP(0.037) = 0.224

This metric indicates the severity of a firm's internal control issues. A higher score is indicative of more severe internal control issues. I calculate internal control metrics for all firms that report MW based on the manager group weights (*ICI_MAN*), the auditor group weights (*ICI_AUD*), the financial analyst group weights (*ICI_AN*), all auditor and manager participants (*ICI_A&M*), and all participants (*ICI_ALL*).

### B.8 AHP Application

To test the robustness of the metric that is obtained through the above process, I use the results of the AHP analysis and examine whether these results are related to firm

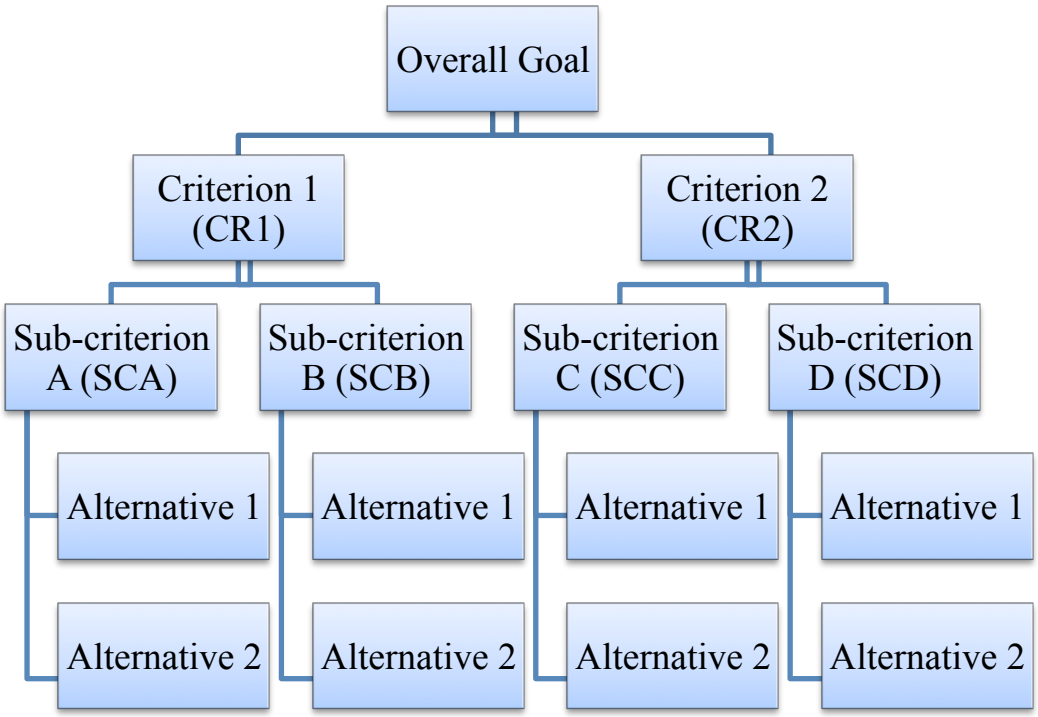
performance as proxied by cumulative annual stock market returns. Auditors and academics alike have touted increased returns are among of the benefits associated with strong internal control systems (Hammersley et al 2008; Kim and Park 2009; Gordon and Wilford 2012). As such, I examine whether there is a link between the AHP internal control strength classification and stock market returns in Appendix C, below.

### B.9 Conclusion

Through the above analysis I shed light on two issues that have previously been unexplored. The first issue is the unavailability of an index of internal control strength. The results that are obtained through the above procedures employ the perceptions of stakeholder groups to develop a metric of internal control strength. This metric can then be used to examine empirical issues where the strength of internal control may lead to further additional insights. One such issue, examined within Appendix C, is whether a relation exists between the internal control metric and stock market returns.

In addition to developing a metric, this AHP analysis distinguishes between the perceptions of auditors, financial analysts and managers. Auditors and managers play a clear role in determining the severity of MW. Further, the results of the recent study by Bedard and Graham (2011) indicate that differences exist between manager and auditor assessments of MW severity. These differences may be due to varying opinions of the various stakeholders regarding the specific types of MW. The insights from this AHP analysis provide valuable information that provides an insight into the different values that stakeholders place on the different types of MW.

**Figure B1 – General Direct Comparison AHP Model Example**




This figure graphically illustrates an example of the Direct Comparison AHP Model.

**Figure B2a – General Ratings AHP Model Example**

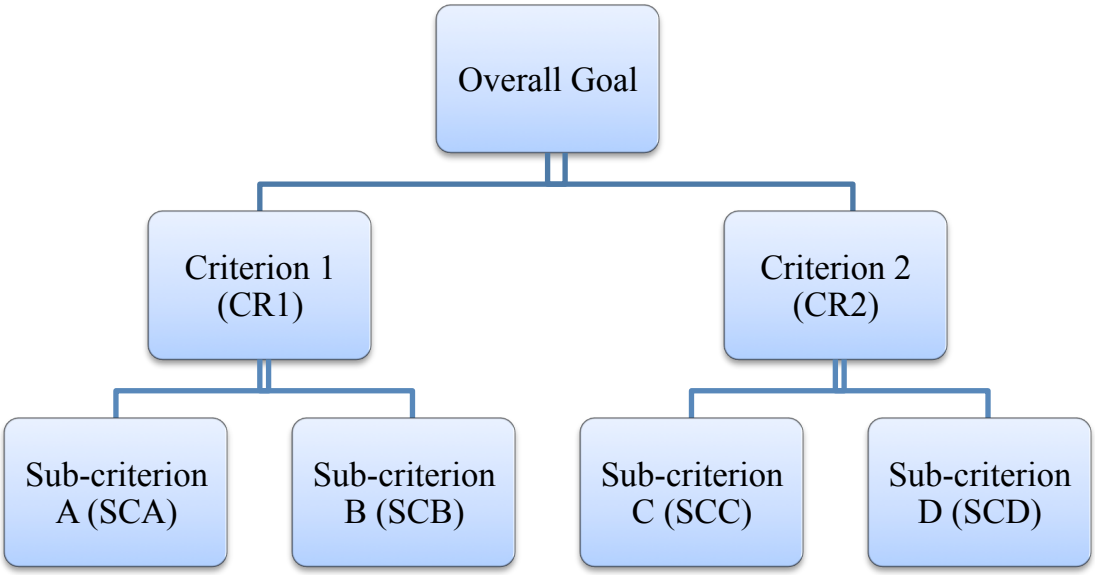



**Figure B2b – Spreadsheet Formulation of Ratings AHP Model**

| | CR1 | | CR2 | | |
|---|---|---|---|---|---|
| | **SCA** | **SCB** | **SCC** | **SCD** | **Score** |
| **Alternative 1** | | | | | |
| **Alternative 2** | | | | | |

Figure B2a presents a graphical illustration of the Ratings AHP Model. Figure B2b presents a spreadsheet formulation of the Ratings AHP Model.

## Figure B3 – Pairwise Comparison Scale[+]

| Value | Definition | Explanation |
|---|---|---|
| 1 | Equally Preferred | The two criteria are equally preferred |
| 3 | Moderately Preferred | Experience and judgment classify one criterion as slightly more preferred than the other |
| 5 | Strongly Preferred | Experience and judgment classify one criterion as strongly more preferred than the other |
| 7 | Very Strongly Preferred | The evidence shows that one criterion is very strongly more preferred than the other |
| 9 | Extremely Strongly Preferred | The evidence that shows one criterion is more preferred than another and is of the highest possible order of affirmation |
| Values of 2, 4, 6, and 8 can be used for intermediate values. Values of 1.1, 1.2, 1.3, etc. can be used for categories that are very close in importance. | | |

This table is a pairwise comparison scale that is used to determine the differences between two criteria.

[+]Adapted from Saaty (1980)

**Figure B4a: Direct Comparison AHP Model – Synthesize Results**

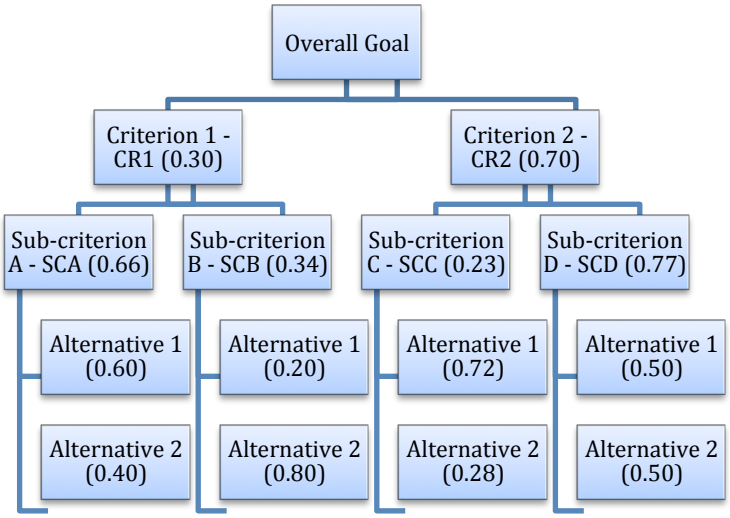



**Figure B4b - Results**

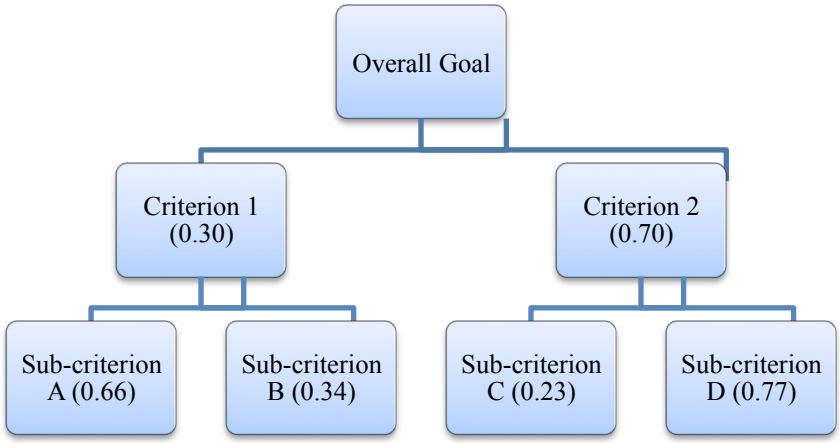
Eval: Alt1= (0.3)(0.66)(0.6)+(0.3)(0.34)(0.2)+(0.7)(0.23)(0.72)+(0.7)(0.77)(0.5)=0.525

Eval: Alt2=(0.3)(0.66)(0.4)+(0.3)(0.34)(0.8)+(0.7)(0.23)(0.28)+(0.7)(0.77)(0.5)=0.475

---

Figure B4a presents a graphical representation of how to apply the weights to the criteria, sub-criteria and alternatives within the Direct Comparison AHP Model. Figure B4b illustrates how to evaluate each alternative by applying the weights.

**Figure B5: Rating AHP Model – Synthesize Results**




| | CR1 | | CR2 | | |
|---|---|---|---|---|---|
| | SCA | SCB | SCC | SCD | Score |
| Alternative 1 | 1 | 0 | 1 | 1 | 0.898 |
| Alternative 2 | 1 | 1 | 0 | 1 | 0.839 |

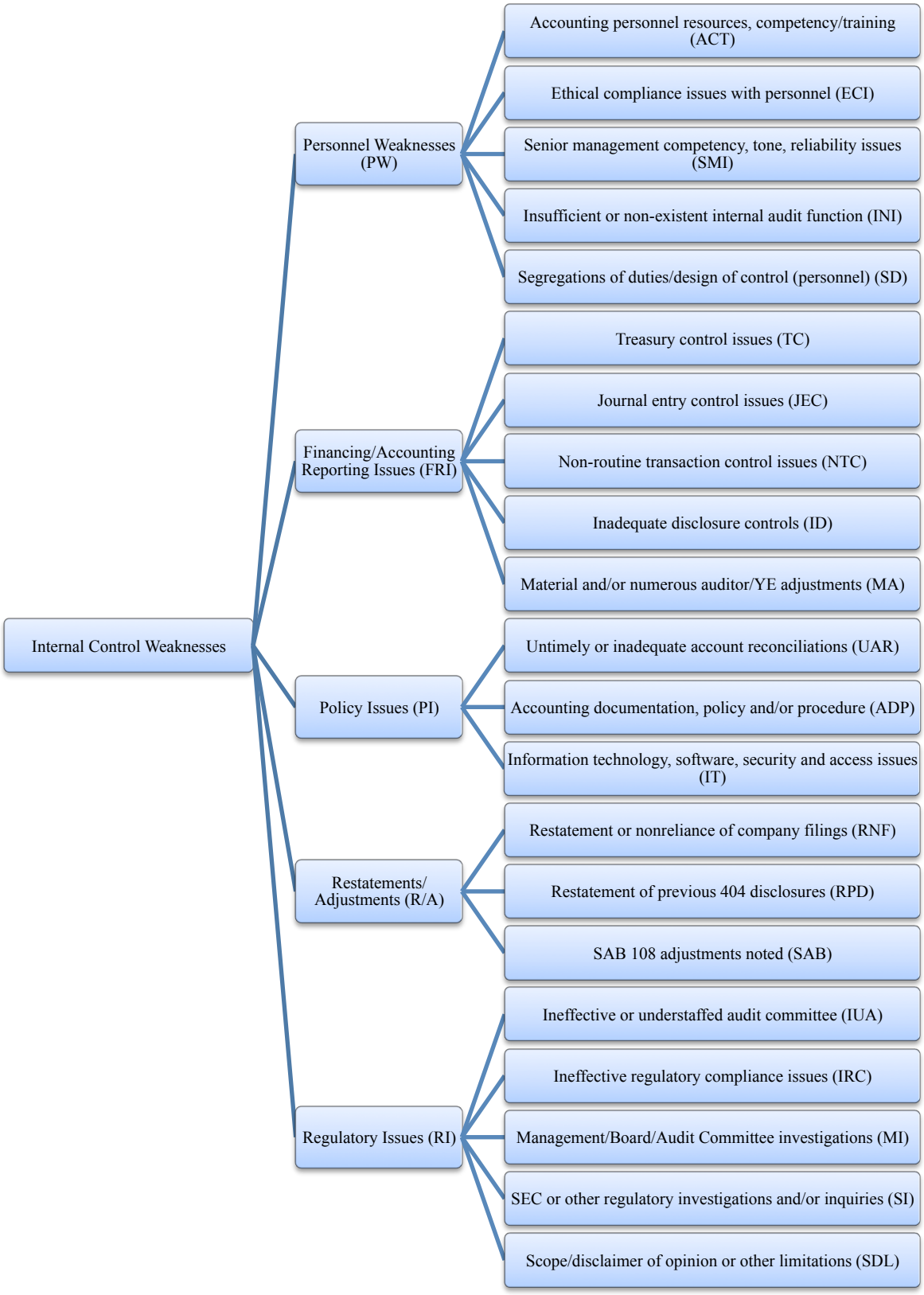
**Alternative 1 = (0.30*0.66*1)+(0.30*0.34*0)+(0.70*0.23*1)+(0.70*0.77*1) = .898**

**Alternative 2= (0.30*0.66*1)+(0.30*0.34*1)+(0.70*0.23*0)+(0.70*0.77*1) = .839**

---

The graphic in Figure B5 presents a representation of how to apply the weights to the criteria and sub-criteria. As a second step, these weights are then applied to the Alternatives based upon whether the alternative is present or not.

## Figure B6 – Internal Control Weakness AHP Tree



## Figure B7 – Pairwise Comparison Questionnaire Example

**Definitions:**

**Personnel Weaknesses** is a material weakness category that includes the following five types of material weaknesses: (1) Accounting personnel resources, competency/training, (2) Ethical compliance issues with personnel, (3) Senior management competency, tone, reliability issues, (4) Insufficient or non-existent internal audit function, (5) Segregations of duties/design of controls.

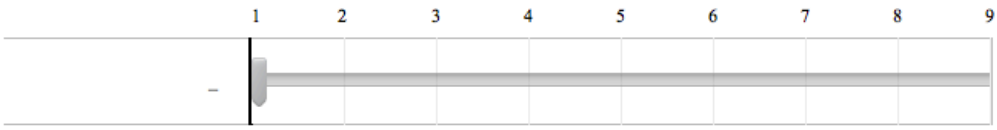
**Financing/Accounting Reporting Weaknesses** is a material weakness category that includes the following five types of material weaknesses: (1) Treasury control issues, (2) Journal entry control issues, (3) Non-routine transaction control issues, (4) Inadequate disclosure control issues, and (5) Material and/or numerous auditor/YE adjustment issues.

Using the definitions above, please indicate by clicking below which (if either) of the material weakness categories would have a greater impact on the financial reporting process of a firm.

- ○ A. Personnel Weaknesses have a greater impact on a firm's financial reporting process than Financing/Accounting Reporting Weaknesses
- ○ B. Financing/Accounting Reporting Weaknesses have a greater impact on a firm's financial reporting process than Personnel Weaknesses
- ○ C. Personnel Weaknesses and Financing/Accounting Reporting Weaknesses have an equal impact on a firm's financial reporting process

Given your decision indicated above, please use the table below to determine how much greater of an impact your selected material weakness category will have on a firm's financial reporting process compared to the other material weakness category. Once you have made a decision please indicate your choice using the slider below:

| **Scale for Pairwise Comparisons of Material Weakness Types** | |
|---|---|
| **Intensity of Importance** | **Definition** |
| 1 | Equal Impact |
| 3 | Moderately Greater Impact |
| 5 | Strongly Greater Impact |
| 7 | Very Strongly Greater Impact |
| 9 | Extremely Greater Impact |
| **Values of 2, 4, 6 and 8 can be used for intermediate values.** | |



## Figure B8 – Auditor 1 Comparison Matrix

| Auditor 1 | | | | | |
|---|---|---|---|---|---|
| | **PW** | **FRI** | **PI** | **R/A** | **RI** |
| **PW** | 1.0000 | 0.3333 | 0.2000 | 3.0000 | 3.0000 |
| **FRI** | 3.0000 | 1.0000 | 0.7000 | 3.0000 | 5.0000 |
| **PI** | 5.0000 | 1.4286 | 1.0000 | 3.0000 | 5.0000 |
| **R/A** | 0.3333 | 0.3333 | 0.3333 | 1.0000 | 1.0000 |
| **RI** | 0.3333 | 0.2000 | 0.2000 | 1.0000 | 1.0000 |
| **Sum** | **9.6667** | **3.2952** | **2.4333** | **11.0000** | **15.0000** |

| | **PW** | **FRI** | **PI** | **R/A** | **RI** |
|---|---|---|---|---|---|
| **PW** | 0.1034 | 0.1012 | 0.0822 | 0.2727 | 0.2000 |
| **FRI** | 0.3103 | 0.3035 | 0.2877 | 0.2727 | 0.3333 |
| **PI** | 0.5172 | 0.4335 | 0.4110 | 0.2727 | 0.3333 |
| **R/A** | 0.0345 | 0.1012 | 0.1370 | 0.0909 | 0.0667 |
| **RI** | 0.0345 | 0.0607 | 0.0822 | 0.0909 | 0.0667 |

| | |
|---|---|
| **PW** | **0.15190** |
| **FRI** | **0.30151** |
| **PI** | **0.39356** |
| **R/A** | **0.08604** |
| **RI** | **0.06699** |

| **Consistency** |
|---|
| 0.0581 |

The top third of the Figure B8 displays the pairwise comparison matrix for Auditor 1's criteria category. The pairwise comparisons made by the participant are entered into the top half (highlighted area) of the table and the reciprocals are then calculated in the bottom half of the table. To calculate the weights to be assigned to each criteria and sub-criteria, three steps are performed: (1) divide each element in the pairwise comparison matrix by the sum of all the elements in its column (these results are displayed as the middle section of Figure B8) (2) the rows displayed as the middle portion of Figure B8 are summed and then divided by the number of criteria (in this case 5) (3) the resulting weights are displayed as the bottom third of Figure B8. This figure indicates that Auditor 1 assigns a weight of 0.1519 to the Personnel Weakness criterion (PW), etc. Consistency is a measure of the consistency of the individual's judgments. The definition of its calculation is explained on page 110.

PW=Personnel Weaknesses; FRI=Financing/Accounting Reporting Issues; PI=Policy Issues; R/A=Restatements/Adjustments; RI=Regulatory Issues

## Figure B9 – AHP Weights by Group

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Manager Group** | **Criteria** | **PW 0.510** | | | | | **FRI 0.113** | | | | | **PI 0.122** | | | **R/A 0.108** | | | **RI 0.147** | | | | |
| | Sub-criteria | ACT | ECI | SMI | INI | SD | TC | JEC | NTC | ID | MA | UAR | ADP | IT | RNF | RPD | SAB | IUA | IRC | MI | SI | SDL |
| | | 0.165 | 0.269 | 0.367 | 0.064 | 0.134 | 0.147 | 0.224 | 0.246 | 0.104 | 0.279 | 0.281 | 0.305 | 0.414 | 0.395 | 0.222 | 0.382 | 0.164 | 0.172 | 0.119 | 0.319 | 0.225 |
| | **Weight** | **0.084** | **0.137** | **0.187** | **0.033** | **0.068** | **0.017** | **0.025** | **0.028** | **0.012** | **0.032** | **0.034** | **0.037** | **0.051** | **0.043** | **0.024** | **0.041** | **0.024** | **0.025** | **0.018** | **0.047** | **0.033** |
| **Auditor Group** | **Criteria** | **PW 0.289** | | | | | **FRI 0.237** | | | | | **PI 0.246** | | | **R/A 0.090** | | | **RI 0.137** | | | | |
| | Sub-criteria | ACT | ECI | SMI | INI | SD | TC | JEC | NTC | ID | MA | UAR | ADP | IT | RNF | RPD | SAB | IUA | IRC | MI | SI | SDL |
| | | 0.106 | 0.207 | 0.364 | 0.100 | 0.223 | 0.182 | 0.284 | 0.181 | 0.103 | 0.250 | 0.295 | 0.454 | 0.251 | 0.583 | 0.188 | 0.229 | 0.123 | 0.080 | 0.274 | 0.245 | 0.279 |
| | **Weight** | **0.031** | **0.060** | **0.105** | **0.029** | **0.065** | **0.043** | **0.067** | **0.043** | **0.024** | **0.059** | **0.073** | **0.112** | **0.062** | **0.053** | **0.017** | **0.021** | **0.017** | **0.011** | **0.038** | **0.034** | **0.038** |
| **Financial Analyst Group** | **Criteria** | **PW 0.203** | | | | | **FRI 0.258** | | | | | **PI 0.249** | | | **R/A 0.076** | | | **RI 0.214** | | | | |
| | Sub-criteria | ACT | ECI | SMI | INI | SD | TC | JEC | NTC | ID | MA | UAR | ADP | IT | RNF | RPD | SAB | IUA | IRC | MI | SI | SDL |
| | | 0.172 | 0.249 | 0.244 | 0.193 | 0.143 | 0.172 | 0.253 | 0.179 | 0.228 | 0.168 | 0.278 | 0.556 | 0.166 | 0.387 | 0.190 | 0.423 | 0.198 | 0.147 | 0.226 | 0.302 | 0.127 |
| | **Weight** | **0.035** | **0.050** | **0.049** | **0.039** | **0.029** | **0.044** | **0.065** | **0.046** | **0.059** | **0.043** | **0.069** | **0.139** | **0.041** | **0.030** | **0.015** | **0.032** | **0.042** | **0.032** | **0.048** | **0.065** | **0.027** |
| **Auditor and Manager Group** | **Criteria** | **PW 0.399** | | | | | **FRI 0.171** | | | | | **PI 0.180** | | | **R/A 0.103** | | | **RI 0.148** | | | | |
| | Sub-criteria | ACT | ECI | SMI | INI | SD | TC | JEC | NTC | ID | MA | UAR | ADP | IT | RNF | RPD | SAB | IUA | IRC | MI | SI | SDL |
| | | 0.134 | 0.239 | 0.371 | 0.081 | 0.175 | 0.164 | 0.254 | 0.212 | 0.104 | 0.266 | 0.293 | 0.379 | 0.328 | 0.490 | 0.208 | 0.302 | 0.146 | 0.121 | 0.187 | 0.289 | 0.259 |
| | **Weight** | **0.053** | **0.095** | **0.148** | **0.032** | **0.070** | **0.028** | **0.043** | **0.036** | **0.018** | **0.045** | **0.053** | **0.068** | **0.059** | **0.050** | **0.021** | **0.031** | **0.022** | **0.018** | **0.028** | **0.043** | **0.038** |
| **All Participants** | **Criteria** | **PW 0.350** | | | | | **FRI 0.190** | | | | | **PI 0.198** | | | **R/A 0.098** | | | **RI 0.164** | | | | |
| | Sub-criteria | ACT | ECI | SMI | INI | SD | TC | JEC | NTC | ID | MA | UAR | ADP | IT | RNF | RPD | SAB | IUA | IRC | MI | SI | SDL |
| | | 0.148 | 0.232 | 0.325 | 0.110 | 0.183 | 0.168 | 0.256 | 0.207 | 0.125 | 0.243 | 0.294 | 0.419 | 0.286 | 0.467 | 0.205 | 0.327 | 0.157 | 0.127 | 0.197 | 0.295 | 0.223 |
| | **Weight** | **0.052** | **0.081** | **0.114** | **0.039** | **0.064** | **0.032** | **0.049** | **0.039** | **0.024** | **0.046** | **0.058** | **0.083** | **0.057** | **0.046** | **0.020** | **0.032** | **0.026** | **0.021** | **0.032** | **0.048** | **0.037** |

Figure B9 displays the weights from the criteria and sub-criteria pairwise comparison matrices of each of the groups. The group weights are calculated through the geometric average. Additionally, the final weight for each MW type (sub-criteria) is calculated by multiplying the criteria weights by the sub-criteria weights (i.e., the weight that would be applied to sub-criteria ACT, for the manager group, is calculated as the weight of PW (0.510) multiplied by the weight of ACT (0.165)).

*Figure B9 Cont.*

The definitions for the criteria and sub-criteria are as follows: PW=Personnel Weaknesses; FRI=Financing/Accounting Reporting Issues; PI=Policy Issues; R/A=Restatements/Adjustments; RI=Regulatory Issues; ACT=Accounting personnel resources, competency/training; ECI=Ethical compliance issues with personnel; SMI=Senior management competency, tone, reliability issues; INI=Insufficient or non-existent internal audit function; SD=Segregations of duties/design of control (personnel); TC=Treasury control issues; JEC=Journal entry control issues; NTC=Non-routine transaction control issues; ID=Inadequate disclosure controls; MA=Material and/or numerous auditor/YE adjustments; UAR=Untimely or inadequate account reconciliations; ADP=Accounting documentation, policy and/or procedure; IT=Information technology, software, security and access issues; RNF=Restatement or nonreliance of company filings; RPD=Restatement of previous 404 disclosures; SAB=SAB 108 adjustments noted; IUA=Ineffective or understaffed audit committee; IRC=Ineffective regulatory compliance issues; MI=Management/Board/Audit Committee investigations; SI=SEC or other regulatory investigations and/or inquiries; SDL=Scope/disclaimer of opinion or other limitations

# Appendix C: AHP Internal Control Metric and Firm Performance

## C.1 Introduction

Appendix B introduces a metric for internal control strength that is developed through AHP. Prior literature recognizes that the category (account-specific versus entity-level) of reported MW and even specific MW have differing effects on accrual quality (Doyle et al. 2007b) and management forecast accuracy (Feng et al. 2009; Li et al. 2011). This appendix discusses a preliminary study that examines the robustness of the internal control index, developed above, by testing whether a relation exists between performance, proxied by compounded market-adjusted annual stock market returns, and internal control quality, proxied by the AHP Internal Control Metric developed in Appendix B.

## C.2 Hypotheses

Current research indicates that internal control negatively impacts firm performance (Hammersley et al. 2008; Ashbaugh-Skaife et al. 2009; Gordon and Wilford 2012). Additionally, research also indicates that there are differences in firm factor reactions to the various types of MW that are reported (Feng et al. 2009; Li et al. 2012). The results from the AHP study above indicate that financial statement stakeholders perceive that the different types of MW have differing impacts on the financial statements. Given the research that suggests MW negatively impact performance and the different types of MW have different impacts on the financial statements, I develop the following hypothesis to test the robustness of the internal control index.

> **H1: A higher internal control index value will negatively impact performance.**

## C.3 Empirical Study Development

### C.3.1 Methodology

To test the hypothesis defined in the previous section (H1), I use the following OLS regression model to examine the impact of MW in the current year on firm investment efficiency in the following year.

$$CMAR_{i,t} = \beta_0 + \beta_1 * ICI_{i,t} + \beta_2 * MKT\_CAP_{i,t} + \beta_3 * AGE\_FIRM_{i,t} + \beta_4 * FCR_{i,t} + \beta_5 * LOSS_{i,t} + \beta_6 * SL\_GR_{i,t} + \varepsilon_{i,t} \quad (1)$$

When applying the above model, I cluster at the firm level and include industry and year fixed effects. Since I use panel data, I account for industry fixed-effects using the Fama and French (1997) 48-industry classification. The combination of clustering at the firm level and accounting for industry and year fixed effects adjusts standard errors for heteroskedasticity, serial-, and cross-sectional correlation (Petersen 2009; Gow et al. 2010).

### C.3.2 Dependent Variable

The disclosure of MW results in a decrease in stock market returns (Hammersley et al. 2008; Kim and Park 2009). I calculate performance as the compounded annual market-adjusted stock return for each firm (*CMAR*) using data from CRSP. Stock returns are adjusted using the value-weighted market index returns.

### C.3.3 Independent Variables

As stated above, I expect a negative relationship to exist between internal control quality (as defined by the internal control index developed above) and stock market returns. Accordingly, the key independent variable in the current study is the internal control index (*ICI_MAN, ICI_AUD, ICI_AN, ICI_AM,* and *ICI_ALL*). *ICI_MAN* represents the internal control index calculated from the manager participant base,

*ICI_AUD* represents the internal control index calculated from the auditor participant base, *ICI_AN* represents the internal control index calculated from the financial analyst participant base, *ICI_AM* represents the internal control index calculated from the auditor and manager participant base, and *ICI_ALL* represents the internal control index calculated from all participants.

Five control variables are used within the analysis and mirror the variables used by Gordon and Wilford (2012). These control variables are additional independent variables in my model and were selected based on the extant literature. The first control variable is based on the size of the firm I measure this variable as the logarithm of each firm's market capitalization (*MKT_CAP*). I use firm age as the second control variable. This variable is measured as the logarithm of the number of years the firm has existed within the CRSP database (*AGE_FIRM*). I account for a firm's financial stability is the third control variable and measure this variable (*LOSS*) as the sum of earnings before extraordinary items for the past two years (Doyle et al. 2007). If the sum is less than zero, the firm is assigned an indicator variable of one, zero otherwise. As a fourth control variable I measure firm complexity as an indicator variable set equal to one if the firm reported a foreign currency translation adjustment (*FCR*) and zero otherwise. Finally, he fifth control variable, firm fluctuation, is calculated as year over year sales growth for years t-2 through t (where t is the current year) and each observation is decile ranked dependent on its respective average sales growth over the previous three years (Ashbaugh-Skaife et al. 2009).

### C.3.4 Sample Selection

The firms and observations included in this study are drawn from the Audit Analytics database. I draw my initial sample from all firms that report MW within their management internal control reports (8,528) in accordance with SOX Section 404 during the time period of November 2004 (the effective date for reporting under Section 404) through May 2011 (fiscal year 2010). Table 1 summarizes the composition of the final sample of observations used in the current study.

Two screens are applied to the initial sample to arrive at the final sample used in the current study. First, duplicate observations are eliminated (153 observations) to ensure that each firm had at most only one observation included for any given year (i.e., in cases of restatements the last filing is retained). Within the second and final screen, all observations that do not have the CRSP/Compustat data available to calculate the variables used within the current study and discussed above are eliminated. Following these categories of eliminations the analyses in the current study are performed using a total of 2,040 observations (Table C.1).[18]

### C.3.5 Descriptive Statistics

Table C.2 presents univariate statistics for the 2,040 observations that are used in the current study. The compounded market-adjusted stock market returns for the sample have a mean of -0.099. Since this sample is comprised of only firms that report MW, this negative result is not concerning. The internal control indices range from a low of 0.027 to a high of 0.881. All of the internal control indices have similar standard deviations. The financial analyst index (*ICI_AN*) has the lowest values with a low point of 0.027 and

[18] The significant decline in the number of observations is due mostly to the inclusion of non-accelerated filers in the initial sample. These firms are smaller, and CRSP/Compustat data is not available for the majority of firms that fall into this category.

a high point of 0.782. The descriptive statistics associated with the other five control characteristics are consistent with those found described in the capital investments study above and prior research (Gordon and Wilford 2012).

## C.4 Empirical Results

Table C.3 presents the OLS regression results for the test of H1 using equation (1).[19] Equation 1 is estimated separately for each internal control index (*ICI_MAN*, *ICI_AUD*, *ICI_AN*, *ICI_AM*, and *ICI_ALL*). *ICI_MAN*, *ICI_AUD*, *ICI_AN*, *ICI_AM*, and *ICI_ALL* are used as the key independent control variables in columns (1), (2), (3), (4), and (5), respectively. The regression models have adjusted $R^2$s ranging from 15.5 percent to 15.8 percent, with higher explanatory power being attributed to the *ICI_MAN* index.

Over all five specifications of the internal control index using equation (1) and a pooled regression analysis, I reach the same conclusion, the severity if internal control issues, as proxied by the internal control index, has a negative and significant relation with firm performance, proxied by stock market returns. More specifically, I find that the two estimated internal control index coefficients are all negative and significant at the 0.01 level. These results are robust to the inclusion of both firm-level characteristics and industry fixed effects. The results associated with the control variables are consistent with expectations and prior research. The results in Table C.3 suggest that as the severity of internal control issues increases, firm performance decreases.

## C.5 Concluding Comments

This simple study provides a first look at the relation between internal control quality, as proxied by an internal control index, and firm performance. Although the

[19] We test the Variance Inflation Factors for all variables in each regression and find that the maximum factor is less than 5 for each variable. This test alleviates any concerns related to multicollinearity.

results suggest that the AHP developed internal control index is significantly related to firm performance, the results are limited and this relation should be examined further.

## Table C.1
## Internal Control Index Study: Sample Selection

| **Sample Selection** | |
|---|---|
| MW Sample (Observations with MW) | |
| Total number of Section 404 reports with MW for fiscal years 2004-2010 | 8,528 |
| Eliminate duplicates due to financial restatements | (153) |
| Eliminate firm years due to data restrictions imposed by the current study | (6,335) |
| Total number of observations identified for use in the current study | 2,040 |

Table C.1 defines the steps employed to arrive at the final MW and control samples for firms that report on their internal control during fiscal years 2004 through 2010.

**Table C.2**
**Internal Control Index Study: Descriptive Statistics**

| Variable | N | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| CMAR | 2,040 | -0.099 | 0.504 | -0.892 | 2.078 |
| ICI_MAN | 2,040 | 0.182 | 0.115 | 0.032 | 0.857 |
| ICI_AUD | 2,040 | 0.254 | 0.107 | 0.031 | 0.881 |
| ICI_AN | 2,040 | 0.254 | 0.091 | 0.027 | 0.782 |
| ICI_AM | 2,040 | 0.212 | 0.108 | 0.038 | 0.862 |
| ICI_ALL | 2,040 | 0.223 | 0.104 | 0.037 | 0.845 |
| MKT_CAP | 2,040 | 2,010.55 | 15,531.77 | 0.969 | 386,402.10 |
| AGE_FIRM | 2,040 | 13.366 | 12.992 | 0.000 | 85.000 |
| FCR | 2,040 | 0.311 | 0.463 | 0.000 | 1.000 |
| LOSS | 2,040 | 0.451 | 0.498 | 0.000 | 1.000 |
| SL_GR | 2,040 | 5.853 | 2.995 | 1.000 | 10.000 |

This table displays the descriptive statistics. The observations are drawn from the time period of November 2004 through May 2011. All variables are defined within the study.

**Table C.3**
**Relation between the Internal Control Index and Stock Market Returns**

| Variables | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Intercept | -0.89*** | -0.87*** | -0.86*** | -0.88*** | -0.88*** |
| | (0.13) | (0.13) | (0.13) | (0.13) | (0.13) |
| ICI_AUD | -0.35*** | | | | |
| | (0.10) | | | | |
| ICI_MAN | | -0.38*** | | | |
| | | (0.08) | | | |
| ICI_AN | | | -0.37*** | | |
| | | | (0.12) | | |
| ICI_A&M | | | | -0.39*** | |
| | | | | (0.09) | |
| ICI_ALL | | | | | -0.38*** |
| | | | | | (0.10) |
| MKT_CAP | 0.07*** | 0.07*** | 0.07*** | 0.07*** | 0.07*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| AGE_FIRM | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| FCR | 0.01** | 0.01** | 0.01** | 0.01** | 0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| LOSS | -0.04 | -0.04 | -0.04 | -0.04 | -0.04 |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) |
| SL_GR | -0.06** | -0.06** | -0.06** | -0.06** | -0.06** |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) |
| Industry FE | Included | Included | Included | Included | Included |
| Year FE | Included | Included | Included | Included | Included |
| Firm Cluster | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,040 | 2,040 | 2,040 | 2,040 | 2,040 |
| R-squared | 15.80% | 15.60% | 15.50% | 15.70% | 15.70% |

Table 3 reports results for the following OLS regression:

$$CMAR_{i,t} = \beta_0 + \beta_1 * ICI_{i,t} + \beta_2 * MKT\_CAP_{i,t} + \beta_3 * AGE\_FIRM_{i,t} + \beta_4 * FCR_{i,t} + \beta_5 * LOSS_{i,t} + \beta_6 * SL\_GR_{i,t} + \varepsilon_{i,t} \quad (1)$$

Robust standard errors are listed in parentheses. Statistical significance at the 0.01, 0.05, and 0.10 level is indicated by ***, **, and *, respectively, using two-tailed tests. All variables are defined within the study.

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