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LETTER FROM THE EDITOR

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Mahmut Yardimcioglu
Kahramanmaras Sutcu Imam University

DO EXTERNAL FINANCIAL STATEMENT AUDITORS SUFFICIENTLY ADJUST THEIR AUDIT PLANS FOR AUTOMATED-CONTROL DEFICIENCIES?

Daniel D. Selby, University of Richmond

ABSTRACT

Shelton (1999) found that experience, based on rank, mitigates the influence of less-than-diagnostic evidence in going concern assessments. But, numerous studies (e.g., Abdolmohammadi and Wright 1987) question the external validity of studies that use rank to determine experience. I suspect that specialized domain experience is a better measure because all auditor ranks do not have procedural knowledge in going concern decisions but many auditors may have procedural knowledge in audit planning (AICPA 2008) and automated controls (Hunton et al. 2004). I investigate whether external financial statement auditors (henceforth auditors) sufficiently adjust their audit plans for material-automated-control-weaknesses. I determine the sufficiency of auditors' audit plan adjustments by comparing their adjustments for material-automated-control-weaknesses to professionals with specialized domain experience in automated-controls, IT audit specialists. Auditors' audit plan adjustments are significantly lower than IT audit specialist when less-than-diagnostic evidence is present. Thus, specialized domain experience mitigates the influence of less-than-diagnostic evidence. Meanwhile, experience based on rank, does not mitigate the influence of less-than-diagnostic evidence. The implication of my study is that consulting with IT audit specialists while revising plans for material-automated-control-weaknesses may improve the likelihood that adequate resources will be allocated to address automated-control weaknesses and reduce the likelihood of audit failure.

KEYWORDS: Specialized domain experience, diagnostic evidence, audit planning, IT audit specialists, internal controls, automated controls, IT controls

INTRODUCTION

Automated-control-deficiencies in computerized hardware or applications have a reasonable possibility of producing material misstatements in the financial statements (AICPA 2008). One example of an automated-control-deficiency is when financial data is transferred between computer applications without automated verification that all data that was intended to be sent is received. When auditors become aware of an automated-control-deficiency they are encouraged to adjust their audit plans so that they can better assess the effectiveness of the

internal controls and better assess the effects of the weakness on the financial statements (AICPA 2008; PCAOB 2010; IAASB 2010a; IAASB 2010b; ITGI 2007).

In this paper, I investigate whether external financial statement auditors (henceforth, auditors) sufficiently adjust their audit plans for automated-control-deficiencies. I also investigate whether auditors' audit plan adjustments are influenced by less-than-diagnostic evidence.[1] Auditors are allowed to adjust their audit plans for material-automated-control-weaknesses without the assistance of IT (information technology) audit specialists (AICPA 2008; PCAOB 2010; IAASB 2010a; IAASB 2010b). However, auditors perform fewer audit procedures for automated-controls than manual-processes (Brazel and Agolia 2007). Thus, auditors do not possess as much specialized domain experience[2] in automated-controls as IT audit specialists (Weber 1980) and may (1) discount the relevance of automated-controls in audits (Messier et al. 2004), (2) be overconfident about their ability to examine automated-controls (Hunton et al. 2004), (3) provide significance of deficiency ratings for IT control deficiencies that are influenced by management persuasion techniques, (4) not fully utilize their accounting information system expertise for the extent of audit planning (Brazel and Agolia 2007), and (5) find it more difficult to identify the effects of automated-control weaknesses on the financial statements (Vendryzk and Bagranoff 2003). Thus, auditors' lower specialized domain experience in automated-controls may influence them to provide insufficient audit plan adjustments for automated-control-deficiencies. Moreover, auditors' audit plan adjustments for automated-controls may be insufficient in audit settings where less-than-diagnostic evidence is present.[3] My study provides empirical evidence on this issue.

Auditors' audit plan adjustments for automated-control-deficiencies are important because auditors rely on their professional judgment as to whether or not they should seek the assistance of IT professionals when planning the audit. Insufficient audit plan adjustments may lead to too few audit tests or too few audit tested items (Joyce 1976; Kaplan 1985; Johnstone and Bedard 2001). If auditors fail to perform enough tests or fail to sample enough items, audit failure[4] may occur. The likelihood that auditors' would be able to thoroughly assess internal control effectiveness or determine the effects of the material-automated-control-weakness on the financial statements may decrease. Thus, auditors may under-audit and issue unqualified opinions on financial statements and internal controls when qualified or adverse opinions may be more appropriate. It is important to know whether auditors can adequately adjust their audit plans for audit engagements that involve automated controls. Insufficient audit plan adjustments for automated-control-deficiencies can have serious implications on the nature, timing, and extent of control testing and substantive testing.

I conduct a two-phase experiment in which I assess audit plan adjustments as the *adjustment to the audit hours necessary to test controls relative to the prior year* as the dependent variable (Dauber et al. 2005). I manipulate *specialized domain experience* by exposing auditors to automated-control evidence (or manual-process evidence initially, depending on order) in phase 1 and then I expose them to manual-process evidence[5] (automated-control evidence) in phase 2. I

also manipulate the *influence of less-than-diagnostic evidence* by including less-than-diagnostic evidence cues in the audit planning context and then I ask the participants to make the same judgment without the less-than-diagnostic evidence cues (Hackenbrack 1992; Shaft and Vessey 1998; and LaBella and Koehler 2004). To determine whether auditors adjust their audit plans sufficiently for an automated-control-deficiency, where they lack specialized-domain-experience in automated-controls, I compare their adjustments to the audit plan adjustments of IT audit specialists. I also compare the auditors' audit plan adjustments for the automated-control-deficiency to their own adjustments for a manual-processes-deficiency.

I find that less-than-diagnostic evidence and specialized domain experience affect auditors' audit plan adjustments for automated-control-deficiencies. My results are consistent with, and strengthen the results found in Shelton (1999). Shelton (1999) used audit firm rank to classify auditors as more-experienced or less-experienced and investigated whether experience could mitigate the influence of less-than-diagnostic evidence. Shelton found that experience did mitigate the influence of less-than-diagnostic evidence during going concern judgments. However, several studies question the external validity of studies that ignore the merits of procedural knowledge[6] and use ranks within the firm as the measure of experience for unstructured tasks (Abdolmohammadi and Wright 1987; Bonner and Lewis 1990; and Bedard and Biggs 1991). It is likely that the less-experienced auditors in Shelton's study did not have specialized-domain-experience in making going concern judgments while the more-experienced auditors in her study did have specialized-domain-experience in making going concern judgments. So, for this reason, I investigate. My results suggest that auditors insufficiently adjust their audit plans for automated-control-deficiencies. This finding is robust when I compare auditors' audit plan adjustments for automated-control evidence to (1) their adjustments for manual-process evidence and (2) IT audit specialists' audit plan adjustments for automated-control evidence.

My inferences are based on an experiment that captures three important aspects of the internal control environment that prior studies have not captured. First, auditors encounter automated-controls and manual-processes when they examine internal controls (Borthick et al. 2006). Second, IT audit specialists are not included on every audit engagement so auditors make judgments that pertain to automated-controls without the assistance of IT audit specialists (Vendryzk and Bagranoff 2003). Third, less-than-diagnostic evidence tends to be present in audit settings (Hackenbrack 1992). Fourth, auditors may lack the specialized domain experience that is needed to examine the automated portions of internal control structures.

The remainder of the paper is organized as follows. Section II discusses the previous literature and develops my hypotheses. Section III describes the experiment. Section IV presents the results. Section V summarizes the findings and comments on the study's implications.

HYPOTHESIS DEVELOPMENT

Audit planning

Audit planning affects the nature and extent of audit evidence (Joyce 1976). Joyce found that as auditors gain experience, their audit planning judgments move towards the consensus of their peers. Tabor (1983) examined auditor adjustments for internal control reliability and sample size as a means to analyze audit plan adjustments in a within-subjects designed study. Tabor results suggest that audit firm differences influence audit plan adjustments. Guamnitz et al. (1982) asked auditors to estimate the number of hours necessary to assess the propriety and collectability of accounts receivable. Their results suggest that different offices within the same firm could provide significantly different estimates of the hours to complete the same audit task. However, they did not find that years of experience influenced auditors' audit planning hour estimates.

Kaplan (1985) investigated the effects of environmental factors on the audit planning judgments of auditors. Kaplan operationalized environmental factors by using three different industry contexts. A hypothetical client that manufactured picture frames was viewed as the stable client environment manipulation. A hypothetical client in the tire replacement industry was viewed as the slightly dynamic client environment manipulation. Finally, a hypothetical client that manufactured semiconductors was viewed as the dynamic client environment manipulation. Kaplan's results suggest that environmental factors did not affect audit planning judgments. However, Kaplan results do suggest that perceived deterioration of the internal control structure may influence auditors to increase the number of hours in their audit plans. The frequency of information in an audit setting has also been found to also influence the way that auditors allocate hours of audit effort across transaction cycles (Nelson et al. 1995).

Recent studies on audit plans have specifically investigated the effects of various types of risks on external auditor audit plans. Zimbelman (1997) and Johnstone and Bedard (2001) found that fraud risk assessments had no effect on the magnitude of planned audit effort. These results indicate that auditors may maintain a consistent audit strategy that can limit their ability to detect fraud. Contrary to these results, a few studies have identified the impact of other types of risk on auditors' audit plans. Houston et al. (1999) found that the interaction between business risk and intentional misstatements influence audit plan adjustments. Additionally, Bedard and Johnstone (2004) correlate earnings management risk with the amount of planned audit hours.

In my study, I expect that auditors will provide insufficient audit plan adjustments for material-automated-control-weaknesses. The effect of technological innovation, such as automated-controls, in concert with audit planning judgments has received only a little attention in the literature. Bedard et al. (2005) found that control activities risk affect the number of automated-control procedures that auditors perform. Brazel and Agolia (2007) examined the interaction of auditors' knowledge of accounting information systems with their perception of the competence of the IT audit specialists on a hypothetical audit client that implemented a new ERP

system. Brazel and Agolia found that the interaction significantly influenced the planned number of procedures and the planned number of hours that auditors would perform.

Less-than-diagnostic evidence

Audit plan adjustments are subjective and unstructured judgments that request cognitive effort (Davidson and Gist 1996). In order to adjust their audit plans, auditors consider many factors (e.g., competence of specialist on the engagement per Brazel and Agolia 2007). These factors compete for attention (Nelson 1993) but according to Kahneman and Tversky (1972), salient information about the target influences outcome predictions. For example, Choo and Trotman (1991) found that experienced auditors recalled more atypical items than typical items because the atypical items were more difficult to understand. In Choo and Trotman's study, the difficulty of the atypical items may have contributed to their increased salience over the typical items. Unfortunately, not all salient characteristics are diagnostic to the outcome prediction task (Tversky 1977). However, a material-control-weakness is diagnostic and salient in an audit plan adjustment task because material-control-weaknesses signal the need for more audit program resources (Kaplan 1985).

Individuals reduce their assessments of diagnostic[7] cues in prediction tasks when they are exposed to less-than-diagnostic information (Nisbett et al. 1981; Tetlock et al. 1989; Tetlock et al. 1996). Prior research posits that individuals predict future events of interest based on the perceived similarity of features between the target and the predicted outcome. Kemmelmeier (2004) describes the target as the observable object of interests and the predicted outcome as the prediction about the target. Judgment based on similarities between mental models and diagnostic features of available information is normative behavior (Tversky 1977). But, individuals have also been found to base their perceptions on features that are less-than-diagnostic to the event of interest (Nisbett et al. 1981; Tetlock et al. 1989; Tetlock et al. 1996).

The less-than-diagnostic evidence that I use in my experimental instrument provide salient characteristics about the client. However, the less-than-diagnostic evidence that I use in my study contribute little predictive value, if any, to my experimental audit plan adjustment task. People evaluate probabilities by representativeness and select outcomes that are most representative of the information that is available (Tversky and Kahneman 1974). So, auditors should also succumb to Tversky and Kahneman's (1974) *illusions of validity*. Thus, I suspect that less-than-diagnostic evidence will influence auditors to document smaller audit plan adjustments.

The influence of less-than-diagnostic evidence has been widely examined in the accounting literature (Hackenbrack 1992; Glover 1997; and Hoffman and Patton 1997; Shelton 1999). For example, the auditors in Hackenbrack's (1992) study evaluated diagnostic evidence initially in conjunction with less-than-diagnostic evidence and subsequently when the less-than-diagnostic evidence was removed. He found that auditors' fraud risk assessments were affected

by less-than-diagnostic evidence when they evaluated diagnostic evidence simultaneously with less-than-diagnostic evidence versus evaluating the diagnostic evidence alone.

The auditors in Glover's (1997) study were allowed to update their fraud risk judgment after reviewing each of his eight diagnostic evidence cues. Then he assigned the auditors to one long case that embedded one of the diagnostic evidence cues with (1) less-than-diagnostic client information, (2) less-than-diagnostic workpapers, and (3) the less-than-diagnostic results of other audit procedures. Glover found that less-than-diagnostic evidence had more of an effect on auditors' fraud risk assessment in the long case than in the eight short cases.

Hoffman and Patton (1997) also used a within-participant experimental design to examine the influence of less-than-diagnostic evidence. The auditor judgments in Hoffman and Patton's (1997) study were made after participants read two diagnostic cues alone and then again after reading the same two diagnostic cues mixed with four less-than-diagnostic cues. Consistent with the aforementioned accounting studies, Hoffman and Patton also concluded that auditors' fraud risk assessments were affected by the less-than-diagnostic evidence cues.

Shelton (1999) used a between-subject design. The auditors in her study were either provided with diagnostic evidence only or diagnostic evidence plus less-than-diagnostic evidence. She observed that the going concern assessments of less-experienced auditors were affected by the presence of less-than-diagnostic evidence. She also found that the going concern assessments of the more-experienced participants in her study did not vary significantly based on the presence of less-than-diagnostic evidence cues. Shelton concluded that experience mitigates the effects of dilution.

Shelton's findings are contradicted by the evidence presented in Bhattacharjee and Moreno (2002). Similar to Shelton (1999), Bhattacharjee and Moreno (2002) examined the effects of experience and the influence of less-than-diagnostic evidence by partitioning their participants into an experienced or a less-experienced group. The major difference is that Bhattacharjee and Moreno's less experienced group includes staff-level auditors with senior-level auditors. Whereas Shelton's less-experienced group consisted of only senior auditors. Another major difference between these two studies is that the auditors in Bhattacharjee and Moreno's study analyzed the risk that inventory was obsolete while the auditors in Shelton's study assessed the likelihood that the hypothetical client in the experiment would continue as a going concern. Bhattacharjee and Moreno results suggest that experience does not mitigate the effects of less-than-diagnostic evidence. The differences in the results between Shelton (1999) and Bhattacharjee and Moreno (2002) could be driven by the fact that the less-experienced auditors in Bhattacharjee and Moreno's study had procedural knowledge from their practice experience in assessing inventory obsolescence. The less-experienced auditors in Shelton's study may lack procedural knowledge because assessing going concern is not a routine task that less-experienced auditors perform in practice. The going concern assessment is most likely determined by the external "auditor-in-charge" of the audit (AICPA 2008). The external "auditor-in-charge" will tend have procedural

knowledge and higher rank within the firm than less-experienced auditors. My study provides empirical evidence on this issue.

The existing accounting literature (Hackenbrack 1992; Glover 1997; Hoffman and Patton 1997; and Shelton 1999) did find that auditors' judgments were affected by less-than-diagnostic evidence. I investigate the influence of less-than-diagnostic evidence to be consistent with this literature and because this literature describes that less-than-diagnostic evidence is common in internal control environments. Like Hackenbrack, I use a within-subject design and asked auditors to make an initial audit plan adjustment based on a combination of diagnostic and less-than-diagnostic evidence. Then I asked auditors to make their subsequent audit plan adjustment based on the diagnostic evidence alone. Unlike Hackenbrack, I do not use experimental cues that induce increased judgments so that I can focus on the audit failure problem. Specifically, I focus on how less-than-diagnostic evidence may reduce the extent and degree of control audit tests. I predict that auditors will have smaller audit plan adjustments for material control weaknesses when less-than-diagnostic evidence is present. The hypotheses, stated in the alternative form, are:

> *H1a   Less-than-diagnostic evidence will influence auditors to reduce their audit plan adjustments for material manual-process weaknesses.*

> *H1b   Less-than-diagnostic evidence will influence auditors to reduce their audit plan adjustments for material-automated-control-weaknesses.*

Specialized domain experience

Audit firms facilitate the acquisition of specialized domain experience for business purposes by assigning auditors to areas of specialization (e.g., industry specialization in Owhoso et al. 2002). Hunton et al. (2004) and Brazel and Agoglia (2007) describe how Big Four professional service firms attempt to reduce their business risks by using IT audit specialists when the client implements a new ERP. As auditors acquire specialized domain experience, they improve their ability to transfer knowledge from previously solved problems to new, unstructured problems that are related to their area of specialization (Frederick and Libby 1986; Vera-Munoz et al. 2001).

Vera-Munoz et al. (2001) found that management accountants outperformed financial auditors when both groups were asked to identify opportunity costs. Management accountants and financial auditors both have declarative knowledge in identifying opportunity costs. However, Vera-Munoz et al. (2001) attribute their results to the fact that management accountants have procedural knowledge in measuring opportunity costs because they routinely consider opportunity costs. Financial auditors, on the other hand, do not consider opportunity costs on a routine basis.

Borthick et al. (2006) describe knowledge structure as the organized information that individuals have stored in their memory. When individuals solve problems, they rely on their

knowledge structure to comprehend problems, process information, and generate subsequent solutions (Zwaan and Radvansky 1998). Knowledge structure can be built from the procedural knowledge that one gains inside a specific domain (Vera-Munoz 1998; Vera-Munoz et al. 2001). Specialized domain experience is expected lead to superior performance when knowledge structures are compatible with tasks (Zwaan and Radvansky 1998).

When knowledge structures are aligned with tasks, those tasks are easier to solve than tasks that are not aligned with knowledge structures (Alba and Hutchinson 1987; Sun 2007; Hambrick et al. 2007). However, it is not clear whether knowledge structure compatibility will improve audit planning judgments (Nelson et al. 1995). Pre-existing knowledge structures can also bias individuals' interpretation of evidence (Greeno 1998). Thus, knowledge structure compatibility can be a benefit or a hindrance. Auditors' knowledge structures, in comparison with IT audit specialists knowledge structures, will tend to be incompatible with automated-control evidence (Weber 1980). If so, auditors may place more weight than necessary on less-than-diagnostic automated-control evidence. But, knowledge structure incompatibility may also be helpful in a judgment prediction context because pre-existing biases towards evidence may be absent (Kintsch 1988).

I predict that auditors will make smaller adjustments to their audit plan for material-automated-control-weaknesses than material-manual-process-weaknesses. Auditors find it more difficult to identify the effects of automated-controls than manual-processes (Vendryzk and Bagranoff 2003). The difficulty that auditors face with automated-controls may stem from the fact that that they work more frequently with manual-process evidence and less frequently with automated-control evidence (Tarantino 2006). Thus, auditors have more procedural knowledge of manual-process evidence than automated-control evidence (Weber 1980). Given the procedural knowledge advantage that auditors have with manual-process evidence, their knowledge structures may be best suited for manual-processes and less suited for automated-controls (Cash et al. 1977; Weber 1980). The hypothesis, stated in the alternative form, is:

> *H2 Auditors will make smaller adjustments to their audit plans for material-automated-control-weaknesses than material manual-process weaknesses.*

IT auditors and auditors assess the strengths of the control points within an internal control system. The control points involve two internal control evidence domains: manual-processes and automated-controls (AICPA 2008). Manual-process evidence is created by humans within the internal control system. Automated-control evidence, on the other hand, is created by the IT infrastructure. Auditors are exposed to automated-controls but auditors do not have the same magnitude of specialized domain experience in automated-controls as IT audit specialists (Vendryzk and Bagranoff 2003; Hall and Singleton 2007). While auditors may have some broad, general knowledge of automated-controls, auditors do not tend to be specialists in automated-controls. Many studies identify the differences between auditors and IT audit

specialist and acknowledge the IT audit specialists' specialized domain experience in automated controls. For example, Vendryzk and Bagranoff (2003) documented that IT audit specialists and auditors are separated within the accounting firm because of their specialized domain experience in automated-controls. However, they align as a team when approaching the client.

Other studies point out that IT audit specialists tend to test automated-controls by "auditing through the computer" while auditors tend to test manual-processes by "auditing around the computer" (Davis and Weber 1986; Biggs et al. 1987; and Messier et al. 2004). Auditors focus their investigations on examining the fairness of the financial statements while IT audit specialists go beyond the fairness of the financial statements and examine with additional automated-control issues such as system reliability, security, application development, system acquisition, and the system development life cycle (Vanacek et al. 1983; Vendryzk and Bagranoff 2003; Hunton et al. 2004; and Brazel and Agolia 2007). These additional technological areas of emphasis by IT audit specialists make their duties more complex than the duties of auditors (Bell et al. 1998; Messier et al. 2004). For example, materiality is much harder to determine during the evaluation of automated-controls than it is for a financial statement audit (Nord et al. 2005; Krishnan et al. 2005).

IT audit specialists are likely to have computer information systems degrees in addition to undergraduate degrees in accounting (Curtis and Viator 2000). The formal training in IT is intended to improve IT audit specialists' ability to address automated-control issues (Curtis and Viator 2000). Auditors, on the other hand, are more likely to hold undergraduate accounting degrees (Curtis and Viator 2000). Finally, IT audit specialists use CobIT[8] as additional guidance to supplement the lack of guidance for auditing automated-controls in Generally Accepted Auditing Standards and International Standards on Auditing (Biggs et al. 1987; Moeller 2004; Tarantino 2006). Auditors are not restricted from using CobIT and are highly encouraged to do so but auditors tend to know very little about CobIT (Moeller 2004).

Task performance is thought to enhance procedural knowledge and improve performance (Herz and Schultz 1999). Auditors tend to perform task in more manual-process evidence contexts than in automated-control evidence contexts (Vendryzk and Bagranoff 2003; Tarantino 2006; Singleton 2007). Procedural knowledge should allow individuals to integrate their preexisting knowledge with unstructured[9] problem contexts (Kole and Healy 2007) and to process patterns of internal control features (Brown and Solomon 1991).

Vera-Munoz et al. (2001) compared the broad domain experience of auditors to the specialized domain experience of management accountants. One assumption in Vera-Munoz et al.'s study is that the auditors and management accountants in the study have similar training and education. But, the managerial accountants in their study also have procedural knowledge in identifying opportunity costs. Their results suggest that individuals with specialized domain experience have the knowledge structure to solve problems even when the problems are presented in an unfamiliar format. Individuals with broad domain experience, on the other hand, perform better at solving problems when the problem is presented in a familiar format. In practice, IT

audit specialists possess specialized domain experience in automated-controls and auditors do not (Weber 1980). So, I compare the audit plan adjustments of auditors to IT audit specialists.

There is evidence that suggests that specialized domain experience may not result in audit plan adjustment differences. For example, Shaft and Vessey (1998) examined the specialized domain experience of twenty-four IT professionals who had procedural knowledge in accounting application programs. Shaft and Vessey determined specialized domain knowledge based on the number of accounting credit hours and the number of years of experience in programming accounting applications. Shaft and Vessey used a within-subjects experimental design where the subjects reviewed lines of computer program code for a payroll accounting application. The participants also reviewed lines of computer program code for a hydrology application where they did not have specialized domain experience. Similar to Shaft and Vessey (1998), I use a within-subjects experimental design but the participants in my study are auditors in an audit planning context. Shaft and Vessey's results suggest that specialized domain experience does not affect the percentage of questions that programmers answered correctly.

Solomon et al. (1999) also provide conflicting evidence on the effects of domain specialization. They analyzed the plausibility of the explanations that auditors provided for two dissimilar client contexts, healthcare and financial institution industries. The auditors in their study had specialized domain experience in one of the two industries. They present mixed results. The auditors who specialized in the healthcare industry were able to take full advantage of their specialized domain knowledge and provide more plausible explanations for financial statement errors and nonerrors in the healthcare context. The auditors who specialized in the financial institution industry, on the other hand, were not able to fully utilize their specialized domain experience. On average, the financial institution specialists provided fewer plausible explanations in their own domain than the healthcare specialists.

I suspect that IT audit specialists have specialized domain experience in automated-controls. I also suspect that IT audit specialists' specialized domain experience in automated-controls derives from their procedural knowledge. Ultimately, procedural knowledge empowers IT audit specialists to possess a deeper structure[10] in automated-controls than auditors. Deep structure is necessary for categorizing and solving problems (Blessings and Ross 1996). Thus, IT audit specialists are experts in automated-controls and their judgments can be used as the criteria to determine the sufficiency of external auditor planning judgments of material-automated-control-weaknesses. I hypothesize that auditors will insufficiently adjust their audit plans for material-automated-control-weaknesses. The hypotheses, stated in the alternative form, are:

> *H3   Auditors will make smaller adjustments to the audit plan for diagnostic automated-control weaknesses than IT audit specialists.*

> *H4   In the typical audit environment, auditors will make smaller adjustments to the audit plan than IT audit specialists.*

RESEARCH METHOD

Participants

Fifty auditors and thirty-seven IT audit specialists from each of the Big 4 accounting firms volunteered and participated in this study. Descriptive data on the participants in the study are provided in Table 1. The auditors had an average of 47.10 months of audit engagement experience where they examined manual-processes. The auditors had worked on an average of 2.58 client engagements where they examined automated-controls. The auditors also had some formal training in IT. On average, auditors completed 1.14 IT courses while they worked professionally and 0.78 IT courses while pursuing their undergraduate degrees. The IT audit specialists had an average of 49.43 months of audit engagement where they examined automated-controls. The IT audit specialists worked on an average of 20.76 client engagements where they examined automated-controls. IT audit specialists completed an average of 7.92 IT courses while they worked professionally and average of 2.95 IT courses while pursuing their undergraduate degrees.

Table 1: Demographics of Experimental Participants Means (Std. Deviations)		
	Auditor Type	
	External Auditors	IT Audit Specialists
n	50	37
Area of Specialized Domain Experience	Manual Processes	Automated Controls
Estimated Months of Experience in Specialized Domain Area	47.10	49.43
	(51.29)	(39.66)
Estimated Number of Engagements Where Participants Reviewed Automated Controls	2.58	20.76
	(3.86)	(26.82)
Estimated Number of IT Training Courses Taken as a Professional	1.14	7.92
	(2.22)	(8.14)
Estimated Number of IT Training Courses Taken While Pursuing Undergraduate Degree	0.78	2.95
	(1.11)	(3.64)

Pre-testing

Two rounds of pre-testing were used. The cues were pre-tested in the first round by two Big Four senior managers who were both licensed as Certified Public Accountants and Certified Information System Auditors. Both senior managers were employed with two different Big Four accounting firms. During round one of pre-testing, the two senior managers provided input on the contexts and wording of the diagnostic and less-than-diagnostic evidence cues. During the second round of pre-testing, the evidence cues were rated between 1 (least diagnostic) and 100 (most diagnostic) by four Big Four IT audit specialists and four Big Four auditors. Both rounds of pre-testing revealed which evidence cues were diagnostic cues and which cues were less-than-

diagnostic cues. The average rating for the diagnostic material manual-process weakness is 90. The average rating for the diagnostic material-automated-control-weakness is 80. The average ratings for the four less-than-diagnostic manual-process cues ranged between 2.6 and 15.9. The average ratings for the four less-than-diagnostic automated-control cues ranged between 3.8 and 22.6.

CASE MATERIAL

Auditors and IT audit specialists read an overview that summarized the purpose for the study. The auditors and IT audit specialists then acknowledged that they were interested in the results of the study and volunteered to participate (the participant response rate was 91 percent). Then I provided each participant with a password and a personal identification number (PIN). Participants used their password to enter the program. After reading the general instructions, participants entered their PIN and provided their formal consent to participate in the study.

Participants initially rated the effectiveness of the prior year's controls after reading a brief narrative about a hypothetical financial institution and an excerpt from the hypothetical company's unqualified independent internal control opinion of the previous year. The 7-point scale was labeled from left to right as "extremely effective" (coded as 1), "effective" (coded as 2), "somewhat effective" (coded as 3), "neutral" (coded as 4), "somewhat ineffective" (coded as 5), "ineffective" (coded as 6), and "extremely ineffective" (coded as 7). The purpose of this step was to allow the participants to establish a baseline perception of the effectiveness of internal controls in the prior year. The average baseline rating was 2.15. So the participants felt that the internal controls were effective in the prior year.

Half of the participants were randomly assigned to the manual-process evidence domain first and then to the automated-control evidence domain. The remaining participants were assigned to the automated-control evidence domain first and then to the manual-process evidence domain second. The order that the participants encountered the evidence cues were not significant ($t = 0.64$, p-value $= 0.190$).

Participants' audit plan adjustments were collected via a computer program that was designed according to the Tailored Design Method (Dilman 2007). The program controlled for order effects by randomizing the presentation order of the setting evidence cues and the program also controlled the order in which the participants completed the tasks in the experiment (Favere-Marchesi 2006). The program mandated responses when necessary and prevented the changing of responses once participants had already answered a question and proceeded to the next webpage. Participants were not subject to any time pressure and spent an average of 38.15 minutes completing the experiment.

Similar to Nisbett et al. (1981) and Hoffman and Patton (1997), I gave participants four less-than-diagnostic cues and one diagnostic cue (for each internal control evidence domain). Participants were given the opportunity to adjust the audit plan after reading four less-than-

diagnostic manual-process cues (or automated-control cues depending on initial order assignment) with the diagnostic material manual-process weakness cue (or diagnostic automated-control weakness cue depending on the order of the initial assignment). Participants were then given the opportunity to adjust the audit plan based only on the diagnostic manual-process weakness cue (or diagnostic automated-control weakness depending on the order of the initial assignment). Participants repeated these steps for the remaining internal control evidence domain.

Participants were asked to provide their audit plan adjustment. They rated the number of audit hours necessary to effectively complete the audit relative to the prior year on an 11-point scale. The scale contained three labels, "Significantly Decrease" (coded as 1), "Do Not Adjust" (Coded as 6), or "Significantly Decrease" (coded as 11). The remaining points on the scale were not labeled. The participants then responded to six multiple choice questions related to internal control evidence domain from Gleim and Hillison's (2006) professional examination preparation guide. The multiple choice questions were intended to distract participants from the next internal control evidence domain case. Participants were then prompted to repeat these steps for the next internal control evidence domain case. After completing the second internal control evidence domain case, participants completed six multiple choice questions for the more recent internal control evidence domain case, a background questionnaire, six new multiple choice questions that dealt with Electronic Fund Transfers, and a manipulation check.

ANALYSIS AND RESULTS

Table 2 provides the means and standard deviations of the auditors' audit plan adjustments. The mean response and standard deviation of the auditors' judgments for the diagnostic material-automated-control-weakness was 8.02 and 1.62, respectively. The mean response and standard deviation of the auditors' audit plan adjustments for the same diagnostic material-automated-control weakness when combined with less-than-diagnostic automated-control evidence was 7.20 and 1.92, respectively. The mean response and standard deviation of the auditors' judgments for the diagnostic material manual-process weakness was 9.04 and 1.67, respectively. The mean response and standard deviation of the auditors' planning adjustments for the same diagnostic material-manual-process weakness when combined with less-than-diagnostic manual-process evidence was 7.78 and 1.46, respectively.

The mean response and standard deviation of the IT audit specialists' audit plan adjustments for the diagnostic material-automated-control-weakness was 8.46 and 1.41, respectively. This information is also provided in Table 2. The mean response and standard deviation of the IT auditor specialists' planning adjustments for the same diagnostic material-automated-control-weakness when combined with less-than-diagnostic automated-control evidence was 7.86 and 1.32, respectively.

Table 2: Means (Std. Deviations) of Audit Plan Adjustments			
	External Auditors	IT Audit	
	Specialized Doman Experience	Specialists	
	NO	YES	
Influence of less-than-diagnostic evidence	Automated Control Domain	Manual Process Domain	Automated Control Domain
Diagnostic Only (material weakness alone)	8.02	9.04	8.46
	(1.62)	(1.67)	(1.41)
Diagnostic with Less-than- diagnostic evidence	7.20	7.78	7.86
	(1.92)	(1.46)	(1.32)

Please observe in Figure 3 that the auditors' lowest mean audit plan adjustment is for the material-automated-control-weakness with less-than-diagnostic evidence. Meanwhile, the auditors' highest mean audit plan adjustment is for the diagnostic material-manual-process weakness. Moreover, auditors' adjustments, in general, are higher for the manual process domain than the automated control domain. This graph of the means of auditors' audit plan adjustments depicts insufficient audit plan adjustments for automated-control weaknesses by auditors.

The results to the test of my hypotheses are provided in Table 3, Table 4, and Table 5. H1a predicts that auditors' audit plan adjustments for manual-process evidence would be lower when less-than-diagnostic evidence is present than when less-than-diagnostic evidence is not present. This would mean that the less-than-diagnostic manual-process evidence influence auditors to reduce their audit plan adjustments for material manual-process weaknesses. As predicted, H1a is significant (t = 5.07, p = <.0001). When less-than-diagnostic manual-process evidence is mixed with diagnostic material-manual-process evidence, the average auditor adjustment is only 7.78 (1.46 standard deviations). When diagnostic material-manual-process evidence is the only evidence is present, the average auditor adjustment is 9.04 (1.67 standard deviations).

H1b predicts that auditors' audit plan adjustments for automated-controls will be lower when less-than-diagnostic evidence is present than when less-than-diagnostic evidence is not present. This would mean that less-than-diagnostic automated-control evidence influence auditors to reduce audit plan adjustments for material-automated-control-weaknesses. As predicted, H1b is significant (t = 2.90, p = .0028). When less-than-diagnostic automated-control evidence is mixed with diagnostic material-automated-control evidence, the average auditor adjustment is only 7.20 (1.92 standard deviations). When diagnostic material-automated-control evidence is the only evidence is present, the average auditor adjustment is 8.02 (1.62 standard deviations).

Table 3: External Auditors' Audit Plan Adjustments Influence of Less-Than-Diagnostic Evidence							
Paired Samples Tests, One-Tail							
	Within-Subjects						
	Less-than-Diagnostic With Diagnostic		Diagnostic Only Material Weakness Only				
Hypothesis	Mean	Std Dev.	Mean	Std. Dev.	df	t-Statistic	p-value
1a: Manual Process							
Domain	7.78	1.46	9.04	1.67	49	5.07	<0.0001
1b: Automated Control							
Domain	7.20	1.92	8.02	1.62	49	2.90	0.0028
n=50							
Response Scale 1-11 (Significantly Decrease – Significantly Increase)							

H2 predicts that auditors' audit plan adjustments of diagnostic material-automated-control-weaknesses will be lower than their audit plan adjustments for diagnostic material-manual-control-weaknesses. This would mean that financial statement auditors do not anticipate that the material-automated-control-weakness used in this study warrants the same magnitude of audit plan adjustment as the material manual-process weakness used in this study. As predicted, H2 is significant (t = 3.73, p = .0002). The mean (standard deviation) adjustment by auditors for the material-automated-control-weakness is 8.02 (1.62). The mean (standard deviation) adjustment by auditors for the material-manual-process-weakness is 9.04 (1.67).

Table 4: External Auditors' Audit Plan Adjustments Evidence Domain Comparison							
Paired Samples Tests, One-Tail							
	Within-Subjects						
	Material Automated Control Weakness		Material Manual Process Weakness				
Hypothesis	Mean	Std Dev	Mean	Std. Dev.	df	t-Statistic	p-value
2. Evidence	8.02	1.62	9.04	1.67	49	3.73	0.0002
n=50							
Response Scale 1-11 (Significantly Decrease – Significantly Increase)							

H3 predicts that auditors will make smaller adjustments to the audit plan for diagnostic automated-control weaknesses than IT audit specialists. The statistical results are displayed in Table 5. For auditors, the mean audit plan adjustments for the material-automated-control-weakness and the standard deviation are 8.02 and 1.62, respectively. For IT audit specialists, the mean audit plan adjustments for the material-automated-control-weakness and the standard deviation is 8.46 and 1.41, respectively. H3 cannot be rejected (t = 1.32, p = <.095).

Table 5: Audit Plan Adjustments Automated Control Domain Evidence							
Independent Samples, One-Tail							
	Between-Subjects						
	n=50		n=37				
	External Auditors		IT Audit Specialists				
Hypothesis	Mean	Std Dev.	Mean	Std. Dev.	df	t-Statistic	p-value
3: Diagnostic Only	8.02	1.62	8.46	1.41	85	1.32	0.0950
4: Typical Audit Environment, Less-Than-Diagnostic With Diagnostic	7.20	1.92	7.86	1.321	84.6	1.92	0.0291
Response Scale 1-11 (Significantly Decrease – Significantly Increase)							

The results in table 5 suggest that IT audit specialists and auditors make similar adjustments to the audit plan in the case of automated-control evidence. This result also suggests that IT audit specialists do not overreact to automated-control weaknesses. I say this because the IT audit specialists' adjustments to the audit plan are statistically similar to auditors' audit plan adjustments. This result is consistent with the survey results found in Haskins (1987) where auditors rated automated-controls and manual-process authorization as two of the most important attributes in a client's control system. The two diagnostic cues in my study are directly related to these attributes presented in Haskins 1987.

In an ideal audit setting, auditors may be able to examine only diagnostic pieces of evidence without the distraction of less-than-diagnostic evidence. But generally, auditors have to consider diagnostic evidence and less-than-diagnostic evidence simultaneously (Hackenbrack 1992). For auditors, the mean (standard deviation) audit plan adjustments for the material-automated-control-weakness with less-than-diagnostic automated-control evidence are 7.20 (1.92), respectively. For IT audit specialists, the mean (standard deviation) audit plan adjustments for the material-automated-control-weakness with less-than-diagnostic automated-control evidence are standard deviation is 7.86 (1.32), respectively. H4 predicts that auditors will make smaller adjustments to the audit plan than IT audit specialists. As predicted, H4 is significant, (t = 1.92, p = .0291). This result suggests that auditors insufficiently adjust their audit plans for material-automated-control-weaknesses when less-than-diagnostic evidence is also present.

In my study, I investigate whether auditors sufficiently adjust their audit plans for material-automated-control-weaknesses. I also investigate whether auditors' audit plan adjustments are influenced by less-than-diagnostic evidence. The results of my H4 suggest that auditors do not sufficiently adjust their audit plan for automated-control weaknesses. The implication of my results for practitioners is that auditors may want to seek the advice of IT audit specialists before revising the audit plan for automated-control weaknesses. Thus, specialized domain knowledge of automated-controls may mitigate the influence of less-than-diagnostic evidence.

I compared the auditors in my study based on the classifications provided in Shelton (1999). The result of my analysis is provided in Table 6. The mean audit plan adjustments of the

more-experienced auditors (rank above senior-level auditors) and the standard deviations of their adjustments are 8.42 and 1.38, respectively.

Table 6: Additional Analysis Audit Plan Adjustments Automated Control Domain Evidence							
Independent Samples, One-Tail							
	Between-Subjects						
	n=50		n=37				
	External Auditors		IT Audit Specialists				
Hypothesis	Mean	Std Dev	Mean	Std. Dev.	df	t-Statistic	p-value
3: Diagnostic Only	8.02	1.62	8.46	1.41	85	1.32	0.0950
4: Typical Audit Environment Less-Than-Diagnostic With Diagnostic	7.20	1.92	7.86	1.321	84.6	1.92	0.0291
Response Scale 1-11 (Significantly Decrease – Significantly Increase)							

The mean audit plan adjustments of the less-experienced auditors (senior-level auditors) and the standard deviations of their adjustments are 7.43 and 1.91, respectively. The audit plan adjustments between the less-experienced auditors and the experienced auditors are not significantly different (t = 1.49, p = 0.0746). Shelton found that experience, based on external auditor ranks within the firm, mitigates the effect of less-than-diagnostic evidence in going concern judgments. However, numerous studies (e.g., Abdolmohammadi and Wright 1987) question the external validity of studies that use rank within the firm as the method of measuring experience. Less-experienced auditors may lack the procedural knowledge that is necessary to perform a going concern task. In my study, I use an internal control setting because, in practice, auditors are exposed to automated-controls when they conduct audits (Hunton et al. 2004). So, auditors have procedural knowledge in automated-controls but they tend to lack the specialized domain knowledge in automated-controls of IT audit specialists (Weber 1980).

During the exit interview, each of the fifty external auditor participants rated the diagnosticity of both diagnostic evidence cues (one material-automated-control-weakness and one material manual-process weakness) and each of the less-than-diagnostic evidence cues (four less-than-diagnostic automated evidence cues and four less-than-diagnostic manual-process cues). The response scale was -3 to 0 to +3 (significantly irrelevant, neutral, significantly relevant). In Table 7, panel A, the univariate ratings of the diagnosticity ratings are significant (F = 12.89, p-value < 0.0001). So, one-way analysis of variance is provided in panel B. As expected, the mean difference between the diagnostic and less-than-diagnostic cues for automated is insignificant (p-value = 0.424). Thus, auditors in my study felt that the less-than-diagnostic automated-control cues were diagnostic to the task when they were not. Although that automated-control means are not significantly different (p-value = 0.424), the diagnostic cue mean is higher, 1.70 (standard deviation 1.18) than the mean for the less-than-diagnostic cues, 1.35 (standard deviation 1.41). In contrast, the auditors did rate the diagnostic manual-process cue significantly higher (p-value < 0.0001) than the less-than-diagnostic cues. The mean for the diagnostic manual-process cue was

2.44 (standard deviation 1.26) and the mean for the less-than-diagnostic cues was 1.05 (standard deviation 1.64).

Table 7: Manipulation Check External Auditors' Diagnosticity Ratings of the Experimental Cues						
Panel A: Univariate Test of Diagnosticity Ratings During Exit Interview						
	df	SS		MS	F	p-value
Diagnositicity Rating	3	83.94		27.98	12.89	<0.0001
Error	496	1076.61		2.71		
Panel B: Tukey Analysis of Diagnosticity Ratings During Exit Interview						
	Diagnostic		Less-than-Diagnostic Mean			
	(N=50)	(N=200)				
Internal Control Evidence Domain	Mean	Std. Dev.	Mean	Std. Dev.	Difference	p-value
Automated	1.70	1.18	1.35	1.41	0.35	0.4240
Manual Process	2.44	1.26	1.05	1.64	1.39	<0.0001
Response Scale -3 to 0 to +3 (Significantly Irrelevant, Neutral, Significantly Relevant)						

I performed a second manipulation check to determine if the subjects were able to identify the source of each domain cue. This information is provided in Table 8. The response scale for this task was 1-6-11 (automated, neutral, manual-process). The mean response for the automated-control domain is 2.86 (standard deviation 2.51). So, the auditors classified the automated-control cues appropriately. The mean response for the manual-process domain cues is above 8.30 (standard deviation 2.87). The auditors also classified the manual-process domain cues appropriately. The domain source ratings for the internal control domains are significantly different ($t = 21.83$, $p < 0.0001$).

Table 8: Manipulation Check External Auditors' Identification of Evidence Domain Source During Exit Interview						
Paired Samples Tests, Two-Tail						
Internal Control Domain						
Automated		Manual Process				
Mean	Std. Dev.	Mean	Std. Dev.	df	t-Statistic	p-value
2.86	2.51	8.30	2.87	249	21.834	<0.0001
n=250						
Response Scale 1-6-11 (Automated, Neutral, Manual Process)						

CONCLUSIONS

In this study, I investigate whether auditors sufficiently adjust their audit plans for material-automated-control-weaknesses. I also investigate whether auditors' audit plan adjustments are influenced by less-than-diagnostic evidence. My results suggest that auditors do not sufficiently adjust their audit plan for automated-control weaknesses. My results also suggest

that auditors are influenced by less-than-diagnostic evidence. The implication of my results is that auditors may want to seek the advice of IT audit specialists before adjusting their audit plans for automated-control weaknesses. IT audit specialists' specialized domain experience of automated-controls may mitigate the influence of less-than-diagnostic automated-control evidence.

I extend Shelton (1999). Shelton found that experience, based on external auditor rank within the firm, mitigates the effect of less-than-diagnostic evidence in going concern judgments. But, many question the external validity of studies that use rank within the firm as the method of measuring experience (e.g., Abdolmohammadi and Wright 1987). Less-experienced auditors may lack the procedural knowledge that is necessary to perform a going concern task. In my study, I use an internal control setting that emulates a common situation in practice where auditors are exposed to automated-controls during audits (Hunton et al. 2004). So, auditors have procedural knowledge in automated-controls but they tend to lack the specialized domain experience in automated-controls of IT audit specialists. I find that specialized domain experience mitigates the influence of less-than-diagnostic evidence but experience, based on rank within the firm, does not mitigate the influence of less-than-diagnostic evidence.

Accounting firms may be able to reduce their likelihood of audit failure if they involve professionals with specialized domain experience in the planning stages of the audit. Professionals with specialized domain experience may provide more optimal judgments than auditors without specialized domain experience. Most importantly, professionals with specialized domain experience may improve the effectiveness of audits. However, the auditor decides whether or not to consult with professionals with specialized domain experience. This paper is only a first step toward addressing this issue. In my study, I investigate one internal control evidence domain (automated-control or manual-process) at a time without blending evidence from the two different internal control domains. I intentionally separate the two internal control evidence domains so that procedural knowledge would not be confounded and to simplify the experimental task. I also use less-than-diagnostic evidence that would induce under-auditing because under-auditing contributes to the issue that is the utmost concern for accounting firms, audit failure (Louwers, et al. 2008). Additionally, it is also unclear how auditors would use input from IT audit specialists when they adjust their audit plans for automated-control-weaknesses. These issues await further empirical investigation.

ENDNOTES

[1.] I define less-than-diagnostic evidence as information that is of little value for a specific judgment outcome. Nisbett et al. (1981) used the term "nondiagnostic" in a similar manner. Hilton and Fein (1989), Macrae et al. (1992), and Waller and Zimbelman (2003) examined how nondiagnostic information reduced outcome predictions. I too restrict my examination to the reduction of outcome predictions (audit planning adjustments) in order to emphasize the potential for audit failure in the contemporary post Sarbanes-Oxley environment. Previous accounting studies used the term nondiagnostic and "seemingly irrelevant" interchangeably to investigate increases and reductions in outcome predictions (e.g., Hackenbrack 1992). In my experiment, over- adjustments to the audit plan by auditors may only signal over-auditing. I do not

2. examine over-auditing because over-auditing does not generally contribute to the audit failure problem, but under-auditing does contribute to audit failure (Louwers et al 2008).

2. Specialized domain experience means procedural knowledge that is gained through experience in a specialized domain (Vera-Munoz et al. 2001).

3. In the typical audit setting, auditors encounter diagnostic evidence comingled with less-than-diagnostic evidence (Hackenbrack 1992; Glover 1997; Hoffman and Patton 1997 Shelton 1999) and multiple internal control cues (per Brown and Solomon 1991) in the form of automated-control evidence and manual-process evidence (Duffy 2004; Borthick et al. 2006).

4. Audit failure occurs when financial statements include a material misstatement and users of the financial statement reply on those financial statements (Louwers, et al. 2008).

5. Per Duffy (2004), manual-processes are internal controls that are expedited by human personnel within the control system. Auditors do not need specialized domain skills in IT when they evaluate manual-process evidence.

6. Procedural knowledge: Stored information about if-then rules that provide situation-specific solutions to problems (Vera-Munoz et al. 2001).

7. Information that is useful for a specific judgment outcome (Nisbett et al. 1981; Hilton and Fein 1989; Macrae et al. 1992; and Young et al. 2001).

8. CobIT stands for Control Objectives for Information and related Technology and is used for information system audits.

9. I describe audit planning as unstructured because, per Abdolmohammadi and Wright (1987), it involves a judgment with infinite alternatives, also with few or no guidelines available.

10. Deep structure knowledge is defined as the set of principles or equations important for solving the problems (Blessings and Ross 1996).

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EXTENSIBLE BUSINESS REPORTING LANGUAGE FOR FINANCIAL REPORTING (XBRL FR) AND FINANCIAL ANALYSTS' ACTIVITY: EARLY EVIDENCE

Kosal Ly, Waseda University

ABSTRACT

On January 30, 2009, the United States Securities and Exchange Commission (US SEC) adopted rules that require firms to provide to the Commission financial statements in XBRL format, as well as posting to its website should a firm maintain one. The use of XBRL for financial reporting brings several benefits to parties interested in financial information such as investors, financial analysts, and regulators alike in that it enhances information exchange, lowers accessing costs and times, reduces errors, and improves information analyses. XBRL can alleviate information overload and time pressure analysts face, and thus affect their forecasting activities. This paper empirically examines the effect of XBRL on analysts' coverage and the quality of their forecasts. Using regression analysis, our results indicate that there are significant increases in analysts' coverage and quality of their earnings forecasts after XBRL adoption.

INTRODUCTION

Developments in information technology over the past two decades have had an impact on financial markets and their users. These developments generally have improved market efficiency. Stice (1991) examines whether share prices react to the public filings of a Securities Exchange Commission (SEC) 10-K and 10-Q form or the publication of the same information in the Wall Street Journal (WSJ). Stice argues that firms sometimes file their 10-K or 10-Q with the SEC several days before the corresponding earnings announcements appear in WSJ. The result shows that share prices react to WSJ publication rather than the SEC filing even if the SEC filing is the first public earnings announcement. From this result, Stice suggests that the method of disclosing and cost of acquiring accounting earnings impacts whether the information embodied in those earnings will be reflected in share prices in a timely fashion. In short, this study provides evidence that any process that depends on the manual or even semi-automatic transformation of data has the potential to delay the release of potentially price sensitive information to the market and consequently to effect market efficiency.

It may be unlikely that these results would persist today, given the electronic submission of filings. For example, Asthana and Balsam (2001) examine the effect of the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) adopted by the US SEC on the market reaction to 10-K filings. EDGAR is used to perform automated collection, validation, indexing,

acceptance, and forwarding of submissions by firms. Its primary purpose is to increase the efficiency and fairness of the security market. They find both a price and volume reaction to the 10-K filings on EDGAR, but don't find those reactions in the pre-EDGAR filing. They conclude that the market reacts more significantly to 10-K's filed on EDGAR and on average 10-K's filed on EDGAR are filed earlier than 10-K's filed under traditional methods.

Even if the evolutionary exchanges of financial information shift from paper format to an electronic one, its usefulness is still limited. So far, electronic reporting of financial information involves the exchange of information in a variety of formats such as portable document (PDF), Hypertext Markup Language (HTML), and so on. Nevertheless, it is still in its infancy because it essentially replicates a paper format with all of its limitations in the electronic environment (Ramin, 2002). Its major limitation is that it is still costly, time-consuming, labor-intensive, and error-prone since further processing and analyzing of these financial information requires human intervention (Berkeley, Connors, &Willis, 2003). This issue is made worse by increased information overload and complexity because of rapid growth of the supply of Web-based businesses and financial information as well as more regulatory requirements.

eXtensible Business Reporting Language (XBRL) has been presented as one of the solutions to these problems. XBRL is a derivative of eXtensible Markup Language (XML), which is an Internet language developed by the World Wide Web Consortium (W3C). Currently, XBRL language is developed by XBRL International, which is not-for-profit consortium of approximately 550 member firms (XBRL international, 2008). Its organizational structure consists of local jurisdictions that represent countries, regions or international bodies and it focuses on the progress of XBRL in its constituting jurisdictions as well as contributes to international development.

Proponents of XBRL claim that benefits accruing to the analyst community are significant. These benefits, as well as empirical evidences, are discussed in detail in a later section of this study. In short, using XBRL makes information processing and analyzing: (1) cheaper because of less cost and effort to process and analyze information; (2) faster because of reduced manual works through automation; and (3) better because of increased levels of comparability, efficiency, transparency, and incorporated information. XBRL can help analysts process, manipulate, and analyze data cheaper, faster, and better, and thus, can be associated with their forecasting activities. This paper therefore investigates the effect of XBRL on financial analysts, particularly the coverage and quality of their earnings forecasts.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

To appreciate the benefits of XBRL, it is important to discuss the limitations and issues of commonly used formats, particularly PDF and HTML formats, to disseminate financial and business information over the Internet.

First, information presented in PDF format usually does not differ much from that of a hardcopy one. It can look exactly like the original paper documents. Nevertheless, compared to traditional hardcopy, PDF documents allow electronic dissemination of information and can therefore improve information delivery and accessibility. One major drawback of PDF document is that it does not improve usability of information. For example, as in the case of paper format, to analyze a firm's performance, users still have to read that firm's PDF-format annual reports page by page, manually locate information and re-key or copy and paste that information into their analytical models in an Excel spreadsheet. In general, despite improved information delivery and accessibility, the PDF format is not much better than the traditional hardcopy one. Second, HTML format is more useful than PDF since information in HTML documents can be indexed, searched by search engines, and viewed directly in Web browsers. HTML format still, however, has some limitations. HTML was designed with the purpose of displaying data on the Web., i.e., an HTML tag generally indicates only how the content should appear. It therefore does not indicate what those data mean or are. As a result, instead of identifying unique data from HTML-based pages, search engines will return thousands of potential websites and related data from which investors will have to filter out the needed information. Consequently, information users cannot import and reuse data directly from the Web sources. In short, while the current electronic format improves the dissemination and accessibility of reported information, it does not improve the usability of that reported information, since any further processing can only be done in the same way as with analog information.

THE IMPACT OF XBRL FOR FINANCIAL REPORTING ON ITS USERS

XBRL for financial reporting (XBRL FR) has been presented as one of the solutions to these issues by standardizing the XML-based tags used in financial reporting so that financial reports (e.g., financial statements) can be delivered, collected, compared, and analyzed for various purposes more effectively and efficiently. XBRL FR defines financial reporting concepts in its taxonomy, which are similar in concept to XML schema. XBRL taxonomy, in addition, provides a way by which a "fact" relevant to financial reporting concepts can be reported in XBRL instance, which are analogues to XML instance. With XBRL, user information collecting, verifying, and analyzing will be cheaper, faster, and better, all of which are discussed below:

Cheaper and Faster Information

XBRL affects users of information in that information disseminating and processing is cheaper and faster. First, XBRL affects data aggregators who take the financial information and add value to it by organizing it, or more likely, re-keying it into standardized formats for use by financial analysts and other users. Currently, there is a delay between when the financial information is first filed to regulatory agencies by firms and when that information is available in

data aggregators' databases. For example, the average number of weekdays from the time a firm files its 10-K/10-Q to SEC EDGAR to the time it appears in Compustat's Research Insight database, a well-known capital market aggregator, is 14 weekdays (D'Souza, Ramesh, & Shen, 2007). With XBRL, it is cheaper and timelier for data aggregators to collect and aggregate information. That is, financial information can be automatically integrated into those databases of data aggregators, minimizing human intervention, and thus making data available more quickly to investors and other end-users for timely decision-making.

In addition to data aggregators, financial analysts and other related end-users, retail and institutional investors, who make use of the financial information, also benefit from XBRL. XBRL will lower their cost and time required for data processing and manipulating. Currently, users, particularly retail investors, for instance, seeking broad coverage of firms must either spend considerable time and cost manually collecting, and aggregating the data or subscribe to data aggregators that specialize in this data aggregation process, and incur the expense of service. With XBRL-enabled software, for example, they can download and extract needed data from a regulatory database directly to their models in Excel spreadsheets for analysis with less time and cost.

Better Information

Cheaper and faster information delivering and processing are not the only benefits when adopting XBRL; information also becomes better as discussed in the following section.

First, XBRL is also expected to increase the accuracy of reported information by minimizing human intervention. The flow of financial information from reporting firms to end users involves manual human intervention such as re-keying, copying and pasting of data from one format to another. This manual process exists in every step of the flow and is necessary. Firms usually re-key financial information generated from their accounting software to convert to a format such as ASCII text, PDF, HTML, EXCEL spreadsheet, among others, which is necessary for filing with the regulatory agency, distributing to shareholders, posting on their websites, and so on. Data aggregators, at present, manually key financial information from regulatory agencies and other sources into a format that allows aggregation and facilitates comparison and analysis by other users. Analysts and other end-users are required to manually re-key, copy, and paste that information from related sources (mainly data aggregators and regulatory agencies) into their models for further analysis. These manual interventions occur in each step of the information flow and can introduce errors, thus reducing the accuracy of the information. Minimizing manual data processing with automation via the use of XBRL and its related software, therefore, potentially increases the accuracy of the reported information.

Second, comparability of financial information published in financial statements today faces the problems of terminology issues related to homonyms and synonyms. XBRL, with its well-defined taxonomy, will reduce this problem and thus increase comparability of financial

information (Baldwin, Brown, & Trinkle, 2006). Users wanting to compare financial items in financial statements among firms face difficulty in ensuring that those items belong to the same underlying financial reporting constructs, since firms usually use their own company-specific terms. For instance, there are several different terms for *Accounts Receivables* such as *Receivables, Trade Debtors, and Debtors.* Secondly, it is not uncommon for firms to report their financial reporting concepts in different locations. While one firm, for example, discloses one item of its reporting concept on the face of the financial statements, another discloses it in the notes to the financial statements. This introduces difficulty in locating those items and thus impedes the comparability of financial information. With appropriate XBRL software, users can easily and accurately choose and compare those items. For example, even if firms are able to extend the base taxonomy to modify the standard labels of financial reporting items to their own needs, the names of those financial reporting items (elements) are not affected or changed and thus are recognized by XBRL software as being the same reporting concepts. Moreover, another problem impeding the comparability is that firms often disclose company-specific information. That is, XBRL increases comparability among firms when common taxonomies are used. However, this comparability depends on the extent to which base taxonomies are used and company-specific extension taxonomies are minimized.

Third, XBRL is expected to increase the transparency and efficiency of financial information. Hodge and Maines (2004) examine whether using an XBRL-enhanced search engine helps non-professional investors acquire and integrate financial information for their decision-making. They find that users using XBRL-enhanced technology are better able to acquire and integrate information than those who are not using XBRL. In addition, Pinsker and Wheeler (2009) study the perceptions of non-professional investors on the efficiency and effectiveness of XBRL-enabled financial statement analysis. They particularly compare the perception of participants in two groups of MBA students who are asked to analyze financial statements. They conclude that the XBRL-based group (i.e., the group using XBRL-enabled technology) perceives financial statement analysis to be significantly more efficient than does the paper-based group.

Last of all, less cost and time required to access XBRL-based data means users can include more information into their decision-making. Users will benefit from the ability to incorporate additional information in a tagged, machine-readable format, particularly data found in the footnotes and supplemental tables of financial reports, which are not currently collected on a broad scale due to the cost and time of manual human intervention. Financial analysts, for instance, will be able to incorporate additional XBRL-tagged information in the notes to financial statements or in Management Discussion and Analysis that are valuable to analysis but routinely excluded due to the cost or time constraints (Dreyer & Willis, 2006). Additional incorporated information means users will be able to perform better analysis and decision-making.

EMPIRICAL STUDIES

As XBRL adoption is in its early stage, there exists little empirical evidence on the benefits of XBRL adoption. Yoon, Zo, and Ciganek (2010) examine whether or not XBRL adoption reduces information asymmetry in a Korean stock market, where the level of information asymmetry is proxied by bid-ask spreads. All publicly traded firms in Korea have been required to submit financial statements in XBRL format since October 1, 2007. In effect, the listed companies must file their financial reports, including annual, semi-annual, and quarterly reports to DART (Data Analysis, Retrieval and Transfer) system using XBRL format. They find that a negative and significant relationship exists between XBRL adoption and bid-ask spreads. They thus argue that XBRL adoption may lead to the reduction of the information asymmetry in Korean stock market.

SELL-SIDE ANALYSTS, THE PROPERTIES OF THEIR EARNINGS FORECASTS, AND XBRL DISCLOSURE

Financial analysts act as information intermediaries, who play an important role in disseminating a firm's information. Sell-side analysts are typically employed by broker-dealers to follow firms. Their main task is to evaluate the operations of the firms they cover in order to produce reports containing earnings and growth prospects at different horizons, price targets, recommendations (e.g., "buy", "hold", "sell"), etc. The information or reports they produce can be addressed to internal (e.g., in-house fund managers) or external investors. Overall, there is evidence that financial analysts add value in the capital market (Healy & Palepu, 2001). Financial analysts' earnings forecasts and recommendations, for example, affect share prices (e.g., (Francis & Soffer, 1997; Lys & Sohn, 1990)). In addition, financial analysts are superior to time-series models in forecasting earnings. Their forecasts of earnings are relatively more accurate because they are, presumably in part, able to incorporate more timely economy and firm news into their forecasts than are time-series models (Brown, Hagerman, Griffin, & Zmijewski, 1987); and market participants consequently rely on financial analysts' forecasts as a surrogate for the market's unobservable earnings expectations (Kothari, 2001).

Academics and practitioners have long been interested in the issue of analysts' coverage and their earnings forecasts. It is argued that many financial analysts following a firm represent high firm information exposures for investors. For instance, Easley and O'Hara (2004, p.1578) state in an implication of their theoretical model, that "attracting an active analyst following for a company can also reduce a company's cost of capital, at least to the extent that analysts provide credible information about the company." In addition to analyst coverage, the quality of their forecasts is a signal of the extent of analyst disagreements and uncertainties and thus are thought of as a measure of investor uncertainty. Similar to the reasons for using the mean or median of analyst earnings forecast as the markets' expectation of earnings, the uncertainty of analysts

reflects general uncertainty among investors (Ramnath, Rock, & Shane, 2006). There are thus many existing studies investigating the relationship between the properties of analysts' forecasts and capital markets outcomes such as trading volume, share return, etc. Ramnath, Rock, and Shan (2006) provide a comprehensive review of these existing studies.

XBRL will affect analysts because it minimizes the problems, particularly those related to information overload and time pressure, that effect the coverage and quality of their forecasts. The impact of information overload and time pressure on information users represents two sides of the same event that are intertwined. With the same amount of time, when complexity of information rises, the burden of information processing rises. With the same degree of information complexity, users' ability to process and comprehend decreases when time pressure increases. Information overload has become a serious problem for users and the task of finding relevant and high quality information on the Web is difficult (Herrera-Viedma & Peis, 2003). Iselin (1988) and Hwang and Lin (1999) indicate that information overload has two dimensions, which are: quantity of repeated dimension, and quantity of different dimension, and are also called information diversity. Large amounts and diversified information increase its complexity, which in turn affect users' uses and comprehension of information. Chen, Danielson, and Schoderbek (2003) identify that information complexity reduces analysts' assimilation of the information; and McEwen and Hunton (1999) point out that information's relevance and complexity may result in analysts' tendencies to ignore certain information. Plumlee (2003) provides evidence that analysts choose not to assimilate complex information because the cost would exceed the benefits; therefore, the complexity reduces analysts' use of information. Other streams of research consider information complexity as one source of task complexity (Plumlee, 2003); this, in turn, adversely affects the effectiveness and accuracy of users' decisions (e.g., (Chan, 2001; Zacharakis & Meyer, 2000)).

In short, utilizing information technology can alleviate information overload and time pressures that analysts face. Particularly, as discussed above, XBRL can minimize these issues analysts face, since XBRL has a great impact on the transparency, comparability, and incorporation of financial information, in addition to providing cheaper and timelier information accessing and manipulating. We would expect it to increase the coverage and the quality of their earnings forecasts.

HYPOTHESIS DEVELOPMENT

On January 30, 2009, the United States Securities and Exchange Commission (US SEC) adopted rules that require firms to provide to the Commission a financial statement in XBRL format, as well as posting to its website should firms maintain one. XBRL-based disclosure will be submitted as an exhibit along with the traditional electronic filing in ASCII or HTML-based format. These tagged disclosures include no more or less than information in the elements of the primary financial statements (i.e., balance sheet, income statement, statement of cash flow, and

statement of owner's equity), footnote disclosures, and financial statement schedules. The rules will require a three-year phase-in schedule being with U.S. GAAP filers and a public float over $5 billion will be required to file quarterly or annual reports, which must contain financial statements for financial periods ending on or after June 15, 2009. In the second and third year, the rest of U.S. GAAP filers will follow.

We examine whether the coverage and quality of analysts' earnings forecasts changes in the post-XBRL period, as compared to pre-XBRL period. The post-XBRL period examined in this study is from September 2009 to June 2010 and the pre XBRL period is from September 2008 to June 2009. We use the numbers of analysts' quarterly earnings forecasts to proxy the coverage of analysts' forecasts; and dispersion of analysts' quarterly earnings forecasts as a proxy for the quality of their forecasts at each quarter. The number of analysts' earnings estimates reflects the number of active analysts following a firm. Forecast dispersion reflects uncertainty or information asymmetry among analysts where high dispersion implies low quality or precision. We therefore state the following hypotheses:

H1: *The number of analysts' quarterly earnings forecasts increases after XBRL adoption.*

H2: *The dispersion of analysts' quarterly earnings forecasts decreases after XBRL adoption.*

RESEARCH DESIGN

Variable measurements and regression model

Dependent variable

The number of analysts' quarterly earnings forecasts (*ANF*) is the total number of most recent quarterly EPS estimates at the end of each quarter *t* of firm *i*. In addition, following previous studies (e.g., (Agrawal, Chadha, & Chen, 2006)), we compute analysts' quarterly earnings forecast dispersion (*FDISP*), which is the ratio of the standard deviation of all quarterly earnings forecasts to absolute value of mean value of all those forecasts at the end of each quarter *t* of firm *i*.

Independent variable

The independent variable *(POST)* is a dummy variable where it equals one if the forecasting period for a quarter occurs during the post-XBRL period and zero otherwise.

Control variables

We control for common variables that have been documented by prior studies to be related with analysts' coverage, firms' information environments, and business complexity since these also affect the quality of analysts' earnings forecasts.

Earlier research documents that bigger firms attract coverage by more financial analysts, which also suggests that large firms have better information environments (Bhushan, 1989; Fortin & Roth, 2007).

In addition to firm size, researchers have found that firms with high trading volumes have more financial analyst coverage. Particularly, Fortin and Roth (2007) suggest that brokerage firms are more likely to maintain financial analyst coverage for firms with high trading volumes, since they generally generate more commission income.

The ownership structure of the firms, such as the number of institutions holding a firm's shares, the percentage of its shares held by institutions, and the degree to which the firm is closely held by insiders are likely to affect the amount of coverage (Bhushan, 1989). Particularly, it is expected that the greater the insider ownership percentage in a firm, the less the necessity for extensitve moniring activity and thus the less the demand for analysts' coverage (Moyer, Chatfield, & Sisneros, 1989).

Following, Barth, Kasznik, and Mcnichols (2001), we include growth as a control variable. Due to investor interests and the potential for future investment banking deals, high-growth firms may attract greater analyst coverage. In addtion, analysts may find it more difficult to accurately forecast earnings for high-growth firms.

We also include standard deviation of firms' return volatility as a measure of uncertanty. For example, a prior study has shown a firm's return volatility to be negatively related to analysts' coverage (Irani & Karamanou, 2003). The quality of analsyts' forecasts would aslo increase when there is a lower level of uncertainty.

Next, the business segment refers to the number of major business segments a firm operates. The number of four-digit SIC codes corresponding to the firm is used as a control for the underlying complexity of the firm.

We employ the amount of analyst coverage as an additional control variable when we examine Hypothesis 2 because the number of analysts affects the variations of earnings forecasts. Prior research documents the differences in analysts' forecasts accuracy for profit-making versus loss-making firms. Similarly, earnings may be harder to forecast when they change substantially or decline (Agrawal, Chadha, and Chen, 2006).

With a concern that analysts' coverage and analysts' forecast accuracy may improve over time, we use a time trend variable as a control variable.

Finally, to account for variations in analysts' coverage and the quality of their forecasts across specific industries, we therefore include nine dummy variables for ten industry classifications based on an industry classification benchmark (ICB), and a time variable.

In short, following extant literature, we employ a firm's market capitalization *(MV)*, share turnover (*STO*), percentage of share free float (*FLOAT*), growth in sale (*GROWTH*), return volatility (*SRV*), business segment (*SEGMENT*), the amount of analysts' coverage (*ANF*), decline in earnings (*DECLINE*), losses (*LOSS*), time trend variable (*TIME*) and nine dummy industry variables (*INDM*) as control variables.

$$\text{ANF}_{i,t} = \beta_0 + \beta_1 \text{POST}_{i,t} + \beta_2 \log(\text{MV}_{i,t}) + \beta_3 \log(\text{STO}_{i,t}) + \beta_4 \text{FLOAT}_{i,t} + \beta_5 \log(\text{GROWTH}_{i,t})$$
$$+ \beta_6 \log(\text{SRV}_{i,t}) + \beta_7 \text{SEGMENT}_{i,t} + \beta_8 \text{TIME}_i + \Sigma \delta_j \text{INDUST}_{i,t,j} + \varepsilon_{i,t} \qquad (1)$$

$$\log(\text{FDISP}_{i,t}) = \beta_0 + \beta_1 \text{POST}_{i,t} + \beta_2 \log(\text{MV}_{i,t}) + \beta_3 \log(\text{STO}_{i,t}) + \beta_4 \text{FLOAT}_{i,t}$$
$$+ \beta_5 \log(\text{GROWTH}_{i,t}) + \beta_6 \log(\text{SRV}_{i,t}) + \beta_7 \text{SEGMENT}_{i,t} + \beta_8 \text{ANF}_{i,t}$$
$$+ \beta_9 \text{DECLINE}_{i,t} + \beta_{10} \text{LOSS}_{i,t} + \beta_{11} \text{TIME}_i + \Sigma \delta_j \text{INDUST}_{i,t,j} + \varepsilon_{i,t} \qquad (2)$$

Where:

log (.)	Natural logarithm of variable
ANF	The total number of most recent quarterly EPS estimates at the end of each quarter.
FDISP	The ratio of the standard deviation of all quarterly earnings forecasts to absolute value of mean value of all those forecasts at the end of each quarter.
POST	Dummy variable, which equals one if the earnings forecast period for a quarter occurs during the post-XBRL period, and zero otherwise.
MV	Market value of common equities of firms at the end of each quarter.
STO	The average of the daily numbers of shares traded scaled by the daily numbers of share outstanding for the month of each quarter.
FLOAT	The average of daily percentage of the total numbers of shares outstanding of a firm that is available for trading by the investing publics and is not held for strategic goals for the month of each quarter.
GROWTH	5 Years geometric growth in sale for firm, defined as of the end of each quarter.
SRV	Standard deviation of daily dividend-adjusted returns for firm for the month of each quarter.
SEGMENT	The number of four-digit SIC codes corresponding to the firm.
DECLINE	Indicator variable, which equals one if $EPS_t < EPS_{t-4}$, 0 otherwise.
LOSS	Indicator variable, which equals one if $EPS_t < 0$
TIME	Time-trend variable
INDUST	9 indicator variable(s) based on industry classification benchmark (ICB) code.

Sample selection

EDGAR Dashboard[1] lists all quarterly SEC filings of XBRL filers. In its first year of XBRL adoption, we identified 446 firms which are required by the US SEC to submit XBRL financial reports, and since we limited our sample to only those with December 31st fiscal year-end, the number of filing firms in our analyses is 338 firms.

We collect the data of analysts' earnings forecasts from *I/B/E/S on Datastream*; and data related to independent and control variables from *Thomson Financial database*, *COMPUSTAT,* and *OSIRIS Database.*

EMPIRICAL RESULTS

Descriptive Statistics and Regression Result

Panel A in Table 1 presents descriptive statistics for the dependent variables. The post-XBRL period examined in this study consist of quarterly periods from September, 2009 to June, 2010 and the pre XBRL period is from September 2008 to June, 2009. The results show that, in the post XBRL period, firms exhibit more numbers of quarterly earnings estimates, and smaller earnings forecast's dispersion. The median number of quarterly earnings estimates increases from 13 in the pre-XBRL period to 15 in the post-XBRL period. Earnings forecast dispersion also decreases following XBRL adoption. The differences in the means and medians across the two periods are statistically significant using a *t*-test and *Mann-Whitney-Wilcoxon* test respectively. Panel B in Table 1 exhibits descriptive statistics for control variables. It shows that, on average, firms exhibit higher market equity value and percentage of share free float; but less share turnover, sale growth, return volatility, and earnings, in the post XBRL period.

Furthermore, Table 2 exhibits the result of the *Pearson* correlation coefficients among regression variables. The result indicates that firms with larger market equity value, more share turnover, widely held shares, higher sale growth, and less return volatility have more numbers of analysts' earnings forecasts. In addition, the result shows that analysts' earnings forecasts are of less dispersion for firms having larger return volatility, operating in many business segments, experiencing declines in earnings, and having losses.

Table 3 shows the result from regression analysis of Equation 1, and 2, where standard errors are adjusted for heteroscedasticity and autocorrelation of the error terms. The results indicate that the coefficients of our regression variables of interests (*POST*) have the expected signs and are statistically significant. In the post-XBRL period, relative to the pre-XBRL period, there is an increase in the number of analysts' quarterly earnings forecasts; and a decrease in the analysts' forecast dispersions. All other relationships between the independent and dependent variables from the regression model, when statistically significant, are consistent with what was

expected. In short, our results indicate that analysts' coverage and the quality of their forecasts increase following XBRL adoption.

Table 1: Summary Statistics of Regression Variables							
Panel A: Dependent Variable							
Variable	Period	Numbe	Mean	Median	Min	Max	Std. Dev.
Numbers of Earnings Estimates: *ANF*	If *POST* = 0	1352	13.081	13.000	0.000	39.000	6.439
	If *POST* =1	1352	14.946***	15.000***	0.000	44.000	7.487
	All		14.014	14.000	0.000	44.000	7.043
Forecast Dispersion *FDISP*	If *POST* = 0	1316	30.914	8.015	0.000	3000.000	126.722
	If *POST* =1	1308	18.900***	7.407***	0.000	1000.000	54.980
	All		24.925	7.692	0.000	3000.000	97.944
Panel B: Independent Variables							
Variable	Period	Numbe	Mean	Median	Min	Max	Std. Dev.
Size: *MV*	If *POST* = 0	1344	17966.866	8359.195	26.730	406067.000	32724.920
	If *POST* =1	1343	21094.347***	10215.860***	34.770	329725.000	33823.720
	All		19530.025	9337.090	26.730	406067.000	33309.195
Share Turnover: *STO*	If *POST* = 0	1344	0.018	0.013	0.001	0.178	0.015
	If *POST* =1	1340	0.013***	0.010***	0.001	0.405	0.016
	All		0.015	0.011	0.001	0.405	0.016
Free Float: *FLOAT*	If *POST* = 0	1344	86.634	89.091	11.318	100.000	13.532
	If *POST* =1	1343	87.870***	90.565***	17.000	100.000	12.516
	All		87.252	90.000	11.318	100.000	13.046
Sale Growth: *GROWTH*	If *POST* = 0	1190	0.029	0.023	-0.144	0.426	0.034
	If *POST* =1	1238	0.019***	0.014***	-0.083	0.276	0.030
	All		0.024	0.018	-0.144	0.426	0.033
Return Volatility: *SRV*	If *POST* = 0	1344	0.042	0.035	0.008	0.308	0.028
	If *POST* =1	1343	0.018***	0.016***	0.000	0.113	0.010
	All		0.030	0.023	0.000	0.308	0.024
Segment: *SEGMENT*	If *POST* = 0	1332	3.498	3.000	1.000	9.000	2.444
	If *POST* =1	1332	3.498	3.000	1.000	9.000	2.444
	All		3.498	3.000	1.000	9.000	2.443
Decline: *DECLINE*	If *POST* = 0	1316	0.444	0.000	0.000	1.000	0.497
	If *POST* =1	1320	0.500***	0.500***	0.000	1.000	0.500
	All		0.472	0.000	0.000	1.000	0.499
Loss: *LOSS*	If *POST* = 0	1325	0.075	0.000	0.000	1.000	0.263
	If *POST* =1	1323	0.072	0.000	0.000	1.000	0.258
	All		0.073	0.000	0.000	1.000	0.261
Notes: Asterisks indicates that the means (medians) of the two groups are significantly different using a one-tailed *t*-test (Mann-Whitney-Wilcoxon test) : * 0.05<p≤0.1, ** 0.01<p≤0.05 and *** p≤0.01							

Table 2: Pearson Correlation coefficients of regression variables									
	ANF	*log(F DISP)*	*log(MV)*	*log(STO)*	*FLOAT*	*log(GROWT H)*	*log(SRV)*	*SEG MENT*	*DE CLINE*	*LO SS*
ANF	1									
log(FDISP)	-0.0680***	1								
log(MV)	0.335***	-0.184***	1							
log(STO)	0.117***	0.356***	-0.323***	1						
FLOAT	0.0636**	-0.0247	0.234***	0.0165	1					
log(GROWTH)	0.175***	-0.127***	-0.00595	0.107***	-0.0780***	1				
log(SRV)	-0.0671**	0.335***	-0.257***	0.611***	-0.0508*	0.119***	1			
SEGMENT	0.0168	0.127***	0.255***	-0.0192	0.187***	-0.206***	0.0649**	1		
DECLINE	-0.0513*	0.303***	-0.0672**	0.0746***	0.0281	-0.190***	0.0419*	0.119***	1	
LOSS	-0.00275	0.386***	-0.113***	0.258***	0.0253	-0.218***	0.215***	0.128***	0.213***	1

ANF is the numbers of quarterly earnings forecast; *FDISP* is the ratio of the standard deviation of analysts' earnings forecasts to absolute value of mean value of all those forecasts; *MV* is the market value of common equity; *STO* is share turnover; *FLOAT* is the percentage of share free float; *GROWTH* is 5-year geometric growth in sales; *SRV* is share return volatility; *SEGMENT* is the number of four-digit SIC codes of firms; *DECLINE* is indicator variable, which equals one if $EPS_t < EPS_{t-4}$; and *LOSS* is indicator variable, which equals one if $EPS_t < 0$. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

SUPPLEMENTARY ANALYSES

We first examine the normality of distribution of regression's residuals. Normality of residuals is only required for valid hypothesis testing in that it assures *p*-values for the *t*-tests and *F*-test will be valid (Gujarati, 2003). Normality is, however, a concern only when the size of the sample is small. Since our sample size is relatively large, the distribution of regression coefficients is shown to be asymptotically normal. However, as a robustness check, we further employed the *bootstrapping* method, which can estimate regression coefficients' standard errors and thus confidence intervals when the residuals may not be distributed normally or even approximately normally (Kennedy, 2008, p.58). The *bootstrap* method begins by first estimating the regression model and saving the residuals.

Table 3: Cross-Sectional Time-Series Regression Results		
	ANF	*log(FDSISP)*
POST	0.843**	-0.174*
	(3.30)	(-2.48)
log(MV)	2.254***	-0.0283
	(8.33)	(-0.76)
log(STO)	2.765***	0.225**
	(5.57)	(2.90)
FLOAT	-0.00578	-0.00317
	(-0.25)	(-1.22)
log(GROWTH)	2.650	-0.244

Table 3: Cross-Sectional Time-Series Regression Results		
	ANF	*log(FDSISP)*
	(1.92)	(-0.96)
log(SRV)	-2.763	1.595***
	(-1.54)	(5.48)
SEGMENT	0.0217	0.0308*
	(0.17)	(2.04)
ANF		-0.00837
		(-1.31)
DECLINE		0.365***
		(7.61)
LOSS		1.008***
		(7.06)
TIME	0.201***	0.0740***
	(3.65)	(6.09)
INDUSTs (included)		
Constant	4.720	6.366***
	(1.19)	(11.26)
Observations	2406	2372
R^2	0.435	0.365
Adjusted R^2	0.431	0.359
ANF is the numbers of quarterly earnings forecast; *FDISP* is the ratio of the standard deviation of analysts' earnings forecasts to absolute value of mean value of all those forecasts; *MV* is the market value of common equity; *STO* is share turnover; *FLOAT* is the percentage of share free float; *GROWTH* is 5-year geometric growth in sales; *SRV* is share return volatility; *SEGMENT* is the number of four-digit SIC codes of firms; *DECLINE* is indicator variable, which equals one if $EPS_t < EPS_{t-4}$; *LOSS* is indicator variable, which equals one if $EPS_t < 0$; *TIME* is time trend variable; and *INDUSTs* is 9 indicator variables based on 10 ICB industry classification benchmark. *t* statistics in parentheses. $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$		

It then performs a *Monte Carlo* procedure, using the estimated parameter values (regression coefficients) as the "true" parameter values and the actual values of the independent variables as the fixed independent variable values. During this *Monte Carlo* study, residuals are first drawn with replacement from the set of original residuals; a new set of dependent variable values are then computed, and new regression coefficients are estimated. Replicating this procedure 5,000 times enabled us to estimate sampling distributions of regression coefficients and thus estimate their standard errors, known as bootstrapped standard errors. The result (not shown) suggests that despite changes in *t*-statistics, which is a result of the changes in standard errors, significances of our interested regression coefficients (*POST*) remain unchanged, and thus our conclusion is qualitatively the same.

Second, multicollinearity among explanatory variables makes the estimation of regression coefficients difficult and its standard error large. Myers (1990) suggests that a *variance inflation factor* (VIF) value of ten or more causes a concern of multicollinearity. We check the *variance inflation factor* (VIF) of each regression variable for the presence of multicollinearity between variables and none of them exceed 10, suggesting that multicollinearly is unlikely to be a concern. Third, with a concern that outlying observations may drive the conclusion of the results, we re-estimate the regression equations where outliers are excluded using *Cook's* distance statistics and standard errors are still adjusted for heteroscedasticiy and autocorrelation of the error terms. The results (not provided) suggest that there is an increase in *R*-square when outliers are excluded and our conclusions are qualitatively the same.

Fourth, to control for other individual firm-specific effects which are stable over time (e.g., location, state of incorporation, stock exchange listings etc.), we re-run our regression using fixed effect regression and again the standard errors are adjusted for heteroscedasticiy and autocorrelation of the error terms. The result shown in Table 4 indicates that our coefficients of interest remain statistically significant when we control for firms' fixed effects. In short, our results show that analysts' coverage and the quality of their forecasts increases following XBRL adoption.

Fifth, to provide robust evidence to our conclusion, "pre" and "post" periods were shifted backward of the original analysis periods. By doing so, the "pre" period became September 2006 to June 2007, and the "post" period became September 2007 to June 2008. We then examined whether there were changes in the numbers of analysts' earnings estimates and dispersion of their earnings forecasts. The results of *t*-statistics and simple OLS regressions suggest that there were no significant differences in both the numbers of analysts' earnings estimates and dispersion of their forecasts between the two periods. This is contrary to the original results and therefore indicates that XBRL adoption drives the increases in the numbers of analysts' earnings forecasts and the quality of their forecasts.

Table 4: Fixed Effect Regression Results		
	ANF	*log(FDSISP)*
POST	0.506**	-0.202**
	(2.77)	(-2.96)
log(MV)	0.873**	-0.552***
	(3.24)	(-4.91)
log(STO)	-0.728*	0.0118
	(-2.50)	(0.15)
FLOAT	0.00389	0.00366
	(0.31)	(1.10)
log(GROWTH)	0.436	-0.502
	(0.46)	(-1.77)
log(SRV)	1.067	0.00633

Table 4: Fixed Effect Regression Results		
	ANF	*log(FDSISP)*
	(1.00)	(0.02)
ANF		-0.000548
		(-0.07)
DECLINE		0.189***
		(5.17)
LOSS		0.113
		(0.91)
TIME	0.236***	0.0271*
	(5.58)	(2.28)
Constant	5.369	6.293***
	(1.86)	(6.06)
Observations	2406	2372
R^2	0.207	0.106
Adjusted R^2	0.205	0.102

ANF is the numbers of quarterly earnings forecast; *FDISP* is the ratio of the standard deviation of analysts' earnings forecasts to absolute value of mean value of all those forecasts; *MV* is the market value of common equity; *STO* is share turnover; *FLOAT* is the percentage of share free float; *GROWTH* is 5-year geometric growth in sales; *SRV* is share return volatility; *SEGMENT* is the number of four-digit SIC codes of firms; *DECLINE* is indicator variable, which equals one if $EPS_t < EPS_{t-4}$; *LOSS* is indicator variable, which equals one if $EPS_t < 0$; *TIME* is time trend variable; and *INDUSTs* is 9 indicator variables based on 10 ICB industry classification benchmark. *t* statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Last of all, to control for overall changes in the coverage and quality of earnings forecasts, we use difference-in-difference regression model by including sample of non-filing XBRL firms over the same time period. We include additional dummy variable (*XBRL*) where *XBRL* = 1 for XBRL-filing firms and 0 otherwise; and an interaction variable between *POST* and *XBRL* variable. Our regression equations become:

$$\text{ANF}_{i,t} = \beta_0 + \beta_1 \text{POST}_{i,t} + \beta_2 \text{XBRL}_{i,t} + \beta_3 \text{POST} \times \text{XBRL}_{i,t} + \text{Control Variables} + \varepsilon_{i,t} \qquad (3)$$
$$\log(\text{FDISP}_{i,t}) = \beta_0 + \beta_1 \text{POST}_{i,t} + \beta_2 \text{XBRL}_{i,t} + \beta_3 \text{POST} \times \text{XBRL}_{i,t} + \text{Control Variables} + \varepsilon_{i,t} \qquad (4)$$

In these equations, β_1 captures the difference in the number and dispersion of analysts' earnings forecasts from the pre-XBRL-period to the post-XBRL period of non-XBRL filers. Similarly, ($\beta_1 + \beta_3$) captures these differences of XBRL filers. Consequently, the difference in that pre- and post-period difference between these two groups (difference-in-difference) is captured by β_3. We expect β_3 to be positive for equation 3 and negative for equation 4.

Table 5 exhibits the regression result from the difference-in-difference regression model. The negative and insignificant regression coefficients of *POST* variables in both equations indicate that there are no differences in the numbers and dispersions of analysts' earnings

forecasts of non-XBRL filers from the pre- to post-XBRL period. The sum of regression coefficients of *POST* and *POST×XBRL* are positive and negative value for equation 3 and 4 respectively (i.e., 1.23 for equation 3 and -0.18 for equation 4). These sums are statistically significant using linear combination tests. These results indicate that there are increases in the numbers of analyst forecasts and decreases in their forecast dispersion of XBRL-filers from the pre- to post-XBRL period. In our interests, the difference-in-difference between the two groups is captured by the regression coefficients of *POST×XBRL* variables. The results indicate that the differences in the numbers and dispersion of analyst forecasts of XBRL filers from the pre- to post-XBRL period are statistically and significantly higher than those of non-XBRL filers. Overall, the results further indicate that XBRL adoption drives the increases in the coverage and quality of analyst earnings forecasts.

CONCLUSIONS

We examine if analysts' coverage and their quality of forecasts change following XBRL adoption. Particularly, we investigate whether XBRL affects the numbers and dispersion of analysts' earnings forecasts. We propose two hypotheses: Hypothesis 1 posits an increase in the numbers of analysts' earnings estimates, and Hypothesis 2 posits a decrease in the dispersion of their earnings forecasts, following XBRL adoption. Using pool cross-sectional time-series OLS regression, our results support our hypotheses. The additional analyses such as bootstrapping standard error, fixed effect regression, difference-in-difference regression do not qualitatively alter the conclusions.

Table 5: Difference-in-Difference Regression Results		
	ANF	*log(FDSISP)*
POST	-0.198	-0.0172
	(-1.90)	(-0.36)
XBRL	1.500***	0.133*
	(3.76)	(2.08)
POST×XBRL	1.431***	-0.168***
	(8.24)	(-4.08)
log(MV)	1.693***	-0.154***
	(17.16)	(-7.95)
log(STO)	1.191***	0.162***
	(9.40)	(6.68)
FLOAT	0.0120	-0.00557***
	(1.91)	(-4.80)
log(GROWTH)	1.250***	0.130
	(3.61)	(1.58)
log(SRV)	0.200	0.753***
	(0.39)	(5.68)
SEGMENT	0.241***	0.0338***
	(4.63)	(3.98)
ANF		-0.00323

Table 5: Difference-in-Difference Regression Results		
	ANF	*log(FDSISP)*
		(-0.80)
DECLINE		0.325[***]
		(12.48)
LOSS		0.705[***]
		(17.03)
TIME	0.135[***]	0.0519[***]
	(6.70)	(6.30)
INDUSTs (included)		
Constant	3.101[*]	6.183[***]
	(2.41)	(22.25)
Observations	11120	10157
R^2	0.533	0.256
Adjusted R^2	0.532	0.254

ANF is the numbers of quarterly earnings forecast; *FDISP* is standard deviation of analysts' earnings forecasts; *XBRL* is dummy variable which equals 1 for XBRL-filers and 0 otherwise; *XBRL×POST* is an interactive between *XBRL* and *POST* variable; *MV* is the market value of common equity; *STO* is share turnover; *FLOAT* is the percentage of share free float; *GROWTH* is 5-year geometric growth in sales; *SRV* is share return volatility; *SEGMENT* is the number of four-digit SIC codes of firms; *DECLINE* is indicator variable, which equals one if $EPS_t < EPS_{t-4}$; *LOSS* is indicator variable, which equals one if $EPS_t < 0$; *TIME* is time trend variable; and *INDUSTs* is 9 indicator variables based on 10 ICB industry classification benchmark.
t statistics in parentheses.
[*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

This study also has several implications. XBRL has a potential to reduce information asymmetry in the capital market and a firm's cost of equity capital. Increases in analysts' coverage and quality of their forecasts imply lower information asymmetry in the capital market. In addition, there are many extant theoretical and empirical literatures that posit a negative relationship between the information environment and the firm's cost of equity capital. For example, Easley and O'Hara (2004) state in their implications of their theoretical model that firms can lower their cost of equity capital by attracting more financial analysts. Our findings thus can be an empirical foundation to accelerate the adoption of XBRL in other counties. It also provides incentives for firms to provide XBRL-enable services or applications to increase the coverage and quality of their analysts' forecasts.

Last of all, the effect of XBRL on information users was examined, focusing on the financial analysts. Future research should examine additional benefits of XBRL adoption for various stakeholders and the capital market outcomes of XBRL adoption.

ENDNOTE

http://edgardashboard.xbrlcloud.com/edgar-all-index.html

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THE IMPACT OF SARBANES-OXLEY ACT ON FOREIGN REGISTRANT CROSS-LISTING

Chia-Hui Chen, Providence University
Clara Chia-Sheng Chen, University of New Orleans

ABSTRACT

The authors examine the impacts of the Sarbanes-Oxley Act (SOX) on firm performance among cross-listed foreign registrants in US stock markets in terms of board size, board independence, and disclosure transparency. Multivariate regression analyses were used to compare the effects of regulatory changes in board size, board independence, and disclosure transparency on 79 cross-listed foreign firms from 24 countries during the 1998-2001 pre-SOX and 2003-2008 post-SOX periods. We found that greater board independence and increased disclosure transparency significantly improved post-SOX performance among cross-listed foreign registrants, but increased board size did not make a positive contribution to firm performance.

Keywords: Sarbanes-Oxley Ac; Disclosure Transparency; Firm Performance.

INTRODUCTION

A mix of financial scandals and the information technology (IT) bubble in the 1990s were the main motivating factors behind the passage of the Sarbanes-Oxley Act of 2002 (hereafter referred to as SOX) by the US Congress. To reduce the potential for new financial scandals, SOX contains rules for board of director composition, auditing committees, management compensation, and disclosure transparency for all public companies listed on US stock markets. As an external corporate governance mechanism, Section 301 of the law requires that a majority of directors on the boards of public companies meet certain "independence" criteria.[1] As an internal governance mechanism, SOX Section 404 contains regulations on corporate finance disclosures that are meant to improve reporting transparency.

Baysinger and Butler (1985), Rosenstein and Wyatt (1990), and Weisbach (1988) have all described a positive relationship between outsider-dominated boards of directors and firm performance, and Byrd and Hickman (1992), Brickley, Coles and Terry (1994), and Weisbach (1988) all argue that outside directors are more likely than "insiders" to protect shareholder interests. According to Caplan and Markus (2009), SOX regulations have resulted in the addition of new board members who may be qualified in terms of independence, but not necessarily in terms of knowledge or expertise. If true, then SOX reforms have forced American companies to focus on regulatory compliance rather than strategic orientation. Furthermore, independent

directors may not have sufficient knowledge of the industry in which a company operates or the requisite experience for monitoring business operations, thus exposing firms to more rather than less risk.

Strict US regulations on corporate governance are more stressful for cross-listed foreign registrants[2], especially those from countries with weak corporate governance mechanisms. Georgieva and Lee (2007) and Litvak (2007) argue that the costs associated with SOX compliance greatly outweigh the benefits, therefore foreign registrants may view SOX requirements as an incentive to move into less regulated capital markets. However, from an investor perspective, SOX compliance can serve to improve investor confidence in cross-listed foreign registrants, thereby making it easier for firms that improve their disclosure transparency to raise equity capital. In addition, agency conflicts between foreign registrants and their shareholders in US stock markets may be mitigated by SOX compliance, thus enhancing cross-listed firm value.

SOX impacts on US stock markets have been the focus of formal research and informal debate. Since foreign registrants in US markets have different corporate governance characteristics and abide by different disclosure regulations, they must make significant changes in order to meet current American corporate governance and disclosure requirements. While some researchers claim that these changes have scared away a number of foreign registrants, few have purposefully set out to determine whether SOX compliance improves cross-listed foreign registrant performance. For this project we looked at the impacts of SOX on foreign registrant board size, board independence, and disclosure transparency, and used multivariate regressions to determine the potential for significant improvement in performance among cross-listed firms that comply with SOX regulations. Two of our main findings are (a) board size did not exert a significant impact on foreign registrant performance during the pre- or post-SOX period, and (b) firms that increased the proportions of independent directors on their boards tended to perform better after SOX went into effect. We also found significant improvement in foreign registrant performance associated with better disclosure quality in their financial reporting during the post-SOX period.

This paper is organized as follows: in the following section we will review the literature on performance, board size, and board independence; the impact of SOX on cross-listing firm premium; and disclosure quality and performance. In the third section we will describe our hypotheses, data collection, and analytical methods. In the fourth and fifth sections we will respectively present and discuss our empirical results and offer our conclusions.

LITERATURE REVIEW

Performance, Board Size, and Board Independence

It has been argued from an agency perspective that larger boards of directors mitigate agency problems because they support better monitoring of management actions. However, empirical findings are mixed. According to Jensen (1993), the optimum number of board directors is eight, with board function and corporate performance deteriorating when this number is exceeded. Yermack (1996) has described an inverted "U" relationship between board size and Tobin's Q—in other words, the addition of directors with expertise enhances Tobin's Q until a certain point at which associated costs exceed the marginal benefits. From their investigation of the relationship between board size and corporate performance among Australian public firms, Kiel and Nicholson (2003) found a positive relationship between director number and Tobin's Q. Garg (2007) examined the influence of board size on performance among listed firms in India, and found significantly adverse effects of board size on Tobin's Q, ratio of sales to assets, and ratio of earnings before interest and taxes (EBIT) to assets.

The literature contains many investigations of the association between board independence and firm performance. Empirical findings are mixed. Using an accounting-based performance measure, Baysinger and Bulter (1985) and Weisbach (1988) found positive associations between outsider-dominated boards and firm performance, but Bhagat and Black (1997), Hermalin and Weisbach (1991), and Klein (1998) are among researchers who failed to find noticeable associations between the proportion of independent directors on a board and corporate performance. Agrqwal and Knoeber (1996) are among those reporting a negative association between the same variables. Using a market-based performance measure, Brickley, Coles and Terry (1994), Byrd and Hickman (1992), and Weisbach (1988) all found that outsider board members are more likely to act in the interests of a firm's shareholders, and that the higher the proportion of independent directors on a board, the greater the potential increase in share price. Positive investor reaction to outside director appointments has been described by Rosenstein and Wyatt (1990).

From a valuation perspective, Hermalin and Weisbach (1991) failed to find a significant relationship between the proportion of outside directors and the Tobin's Q of a firm. Among Australian public firms, Kiel and Nicholson (2003) reported a negative impact of a higher proportion of outside directors on Tobin's Q. Among Indian firms, Garg (2007) found no significant relationship between the proportion of independent directors and Tobin's Q for firms whose performances were compared in 2000-2001 and 2002-2003. Garg also reported that Tobin's Q values for public companies in India would improve if independent director proportions increased between one-third and one-half, but would decline if proportions increased by more than one-half—a finding that suggests ineffective monitoring performance on the part of independent directors among Indian public companies.

SOX Impact On Cross-Listing Premium

Litvak (2007) looked at the effects of SOX on cross-listed premiums that American investors are willing to pay in order to purchase shares from cross-listed foreign registrants. His findings indicate that from year-end 2001 (pre-SOX) to year-end 2002 (post-SOX), Tobin's Q and market/book (M/B) ratios for foreign registrants declined significantly relative to those of matching (in terms of size) non-cross-listed foreign companies from the same countries and same industries. Furthermore, Doidge, Karolyi and Stulz (2004) claimed that the appearance of a cross-listing premium following SOX implementation was a result of extreme corporate governance. In contrast, Jain, Kim and Rezaee (2008) argue that liquidity generally improved among companies that enhanced the quality of their financial reports in compliance with SOX rules.

Disclosure Quality and Performance

The SOX Act mandates greater transparency in financial reports issued by public companies; companies that fail to comply are fined. Based on historical cases of corporate scandal, the alleged companies reported a gradual increase in net income year by year, but their operating cash flows showed declining trend and even became insufficient.[3] Accordingly, both net income, operation cash flow, and their interaction represent quality of financial disclosure. If the company does not faithfully represent its financial reports, it would report greater degree of variance of net income to variance of operating cash flows, show greater discrepancy between net income and operating cash flows, and report lower correlation between accruals and operating cash flows. In other words, the company underscoring transparency shows poor quality of information on net income and operating cash flows. Previous studies have proven that degree of variance of net income to variance of operating cash flows, discrepancy between net income and operating cash flows, and correlation between accruals and operating cash flows can be used to account for quality of financial disclosure.[4] However, few researches have examined the association between disclosure quality and corporate performance. For the present study we investigated the impacts of SOX financial disclosure regulations on cross-listed foreign registrant performance.

METHOD

Development of Research Hypotheses

According to Zhu and Small (2007), strict SOX regulations were behind a significant decline in the number of cross-listed foreign registrants in the US, especially among firms in countries marked by weak corporate governance rules. Consistent with findings reported by Doidge et al. (2004), Georgieva and Lee (2007) reported that SOX enactment was followed by a

reduced number of cross-listed foreign registrants from common law countries, but a larger number of registrants from code law countries. Few efforts have been made to determine the precise mechanisms behind these SOX-associated changes. It is likely that prior to SOX enactment, foreign registrants had smaller boards of directors, with positions filled by directors having little professional knowledge or experience in corporate finance, the firm's industry, or related fields—factors associated with business failures and corporate scandals. As stated above, SOX now requires that all public companies in US stock markets have directors with expertise or independence on their boards, the goal being to promote the monitoring of corporate performance. Foreign registrants wanting to comply with SOX rules are likely to add one or more positions to their boards and to fill them with directors who have greater expertise and/or independence. Accordingly, the first research hypothesis is expressed as

> *Hypothesis 1:* *Ceteris paribus, increases in the board sizes of cross-listed foreign registrants following the enactment of SOX Act regulations results in improved corporate performance.*

The SOX Act emphasis on independent directors has two goals: maximizing shareholder wealth, and mitigating conflicts of interest among directors, managers, and shareholders. Prior to SOX, foreign registrants were likely to have smaller boards and/or boards consisting of managerial directors, thus reducing protection for shareholder interests. SOX was designed and passed based on the assumption that if companies choose to increase their proportions of independent directors, firm performance will improve as a result. A negative relationship between independent director proportion and firm performance after controlling for market and firm-specific factors would indicate ineffectiveness among independent directors—specifically, that the board in question is not oriented toward strategy but toward regulatory compliance, thus calling into question the motivation for SOX legislation. The second hypothesis is thus expressed as

> *Hypothesis 2:* *Ceteris paribus, increases in the proportions of independent directors on the boards of foreign registrants due to SOX regulations results in improved corporate performance.*

`Prior to the SOX Act, many public companies (including foreign registrants) showed tendencies toward activities that are not reported on financial statements. Many corporate scandals in the past twenty years have their roots in such non-transparent activities and information. Companies that act in compliance with the Section 404 rules of the SOX Act minimize information asymmetry among managers, boards of directors, and stakeholders, thus giving stakeholders more opportunities to identify risk, and giving directors greater incentive to monitor their own and company performance. The third hypothesis is therefore established as

> *Hypothesis 3:*   *Ceteris paribus, SOX compliance improves foreign registrant disclosure quality and corporate performance.*

Sample and Variable Data

The study sample included foreign registrants cross-listed on the New York and American Stock Exchanges and NASDAQ between 1998 and 2008.[5] Foreign registrants that were delisted or newly cross-listed during this period were removed. Data on cross-listed foreign registrants (i.e., cross-listing dates and exchange membership) were obtained from the Bank of New York Mellon Corporation. The sample was divided into pre- and post-SOX groups (1998-2001 versus 2003-2008 annual firm-level observations) (Table 1). Board size and director independence data were obtained from the annual SEC filings of the foreign registrants.

We evaluated foreign registrant performance from three perspectives: cross-listing premium, Tobin's Q, and M/B ratio. Cross-listing premium was proxied as stock return for each foreign registrant, board size was measured as the number of directors, and board independence was assessed as the fraction of independent directors sitting on a board. "Independence" was identified according to NYSE[6] and NASD[7] rules. Using the studies of Hostak et al. (2006) and Leuz (2006) as models, we assessed disclosure quality according to three constructs: firm-level standard deviation of net income divided by standard deviation of operating cash flow, firm-level median of absolute value of current accruals divided by operating cash flow, and firm-level correlation between current accruals and operating cash flow. Control variables were market return, return on assets, and firm size. Market return, which was used to control for uncertainty in and the macroeconomic effects of US stock markets, was proxied by NASDAQ, NYSE, or ASE index returns, depending on which market the foreign registrant's shares were cross-listed. This data were obtained from the Center for Research in Security Prices (CRSP). ROA was calculated as the ratio of operating income to total assets. Firm size was measured using a natural logarithm of total market capitalization. Annual data for all financial variables were obtained from Global Compustat.

Empirical Specifications

The completeness of firm-year observations on board size and board independence during the pre- and post-SOX periods supported the use of the following cross-sectional ordinary least square (OLS) regression of corporate performance on board size and board independence to test *Hypothesis 1* and *Hypothesis 2*:

Country[a]	Country Code	Pre-SOX		Post-SOX	
		Ticker of Foreign Registrants	Number[b]	Ticker of Foreign Registrants	Number[b]
Argentina	ARG	*BER, CRESY, IRS, TAR, TEO, YPF*	6	*BER, CRESY, IRS, TAR, TEO, YPF*	6
Australia	AUS	*AWC, WBK*	2	*AWC, WBK*	2
Chile	CHL	*CCU, ENI, EOC, MAD, PVD, SQM, VCO*	7	*CCU, ENI, EOC, MAD, PVD, SQM, VCO*	7
China	CHN	*CEA, CHL, GSH, SHI*	4	*CEA, CHL, GSH, SHI*	4
Denmark	DNK	*NVO*	1	*NVO*	1
Finland	FIN	*NOK*	1	*NOK*	1
France	FRA	*ALU, AXA, CGV, EDAP, FLML, FTE, TOT*	7	*ALU, AXA, CGV, EDAP, FLML, FTE, TOT*	7
Hungary	HUN	*MTA*	1	*MTA*	1
Indonesia	IDN	*IIT, TLK*	2	*IIT, TLK*	2
Irland	IRL	*AIB, ELN, RYAAY*	3	*AIB, ELN, RYAAY*	3
Israel	ISR	*BSI, FORTY, TEVA*	3	*BSI, FORTY, TEVA*	3
Italy	ITA	*NTZ, E, STM*	3	*NTZ, E, STM*	3
Japan	JPN	*FUJI, HIT, HMC, KUB, KYO, MITSY, MKTAY, NSANY, NTT, PC, SNE,WACLY*	12	*FUJI, HIT, HMC, KUB, KYO, MITSY, MKTAY, NSANY, NTT, PC, SNE,WACLY*	12
Korea	KOR	*PKX, SKM*	2	*PKX, SKM*	2
Mexico	MEX	*IBA, ICA, KOF, RC, TMM, TMX*	6	*IBA, ICA, KOF, RC, TMM, TMX*	6
Netherlands	NLD	*AEG, ASMI, ASML, CNH, ING, PHG*	6	*AEG, ASMI, ASML, CNH, ING, PHG*	6
Portugal	PRT	*PT*	1	*PT*	1
Russia	RUS	*VIP*	1	*VIP*	1
Spain	ESP	*BBV, REP, TEF*	3	*BBV, REP, TEF*	3
Sweden	SWE	*ERIC*	1	*ERIC*	1
Taiwan	TWN	*TSM*	1	*TSM*	1
United Kingdom	GBR	*BP, BT, CBY, DEO, GSK, VOD*	6	*BP, BT, CBY, DEO, GSK, VOD*	6
Total Observations	**22**		**79**		**79**

Table 1
NUMBER OF FOREIGN REGISTRANTS CROSS-LISTED IN THE US STOCK MARKETS DURING THE PRE-SOX AND THE POST-SOX PERIODS

Notes:

[a.] Country is where the foreign registrant locates. Country code is the 3-digit ISO country code identifying the country of the exchange for the market data presented in the issue record.

[b.] "Number" represents the number of foreign registrants cross-listed in the U.S. capital markets during the pre- and post- SOX periods, respectively.

$$\text{Performance}_{i,t} = \alpha_0 + \alpha_1 \times \text{BZ}_{i,t} + \alpha_2 \times \text{BI}_{i,t} + \alpha_3 \times \text{MR}_{i,t} + \alpha_4 \times \text{ROA}_{i,t} + \alpha_5 \times \text{FZ}_{i,t} + \varepsilon_{i,t} \quad (1)$$

where Performance$_{i,t}$ is assessed in terms of annual stock returns, Tobin's Q, and a firm's M/B ratio. BZ$_{i,t}$ denotes board size, BI$_{i,t}$ board independence, MR$_{i,t}$ market return (index returns of NASDAQ, NYSE or ASE which the foreign registrant's shares were cross-listed.), ROA$_{i,t}$ return on assets, and FZ$_{i,t}$ firm size.

Data from firm-level observations of three constructs of disclosure quality during pre- and post-SOX periods allowed for the use of the following panel OLS regression of corporate performance on board size, board independence, and disclosure quality to test *Hypothesis 3*:

$$\text{Performance}_{i,t} = \gamma_0 + \gamma_1 \times \text{BZ}_{i,t} + \gamma_2 \times \text{BI}_{i,t} + \gamma_3 \times \text{SDNI\_SDOCF}_{i,t} + \gamma_4 \times \text{MCA\_OCF}_{i,t}$$
$$+ \gamma_5 \times \text{COR(NI\_OCF)}_{i,t} + \gamma_6 \times \text{MR}_{i,t} + \gamma_7 \times \text{ROA}_{i,t} + \gamma_8 \times \text{FZ}_{i,t} + \tau_{i,t} \quad (2),$$

where SDNI_SDOCF$_{i,t}$ denotes the standard deviation of net income divided by standard deviation of operating cash flow, MCA_OCF$_{i,t}$ the median of the absolute value of current

accruals divided by operating cash flow, and COR(NI_OCF)$_{i,t}$ the correlation between current accruals and operating cash flow.

RESULTS

Tests for Differences

As shown in Tables 2 and 3, the foreign registrants in our sample reported significantly larger annual stock returns *(mean: 0.02 > 0.00; median: 0.02 > -0.01)*, earned significantly higher ROA *(mean: 0.05 > 0.01; median 0.04 > 0.02)*, and had significantly larger percentages of independent directors sitting on their boards *(mean: 0.46 > 0.37; median: 0.48 > 0.33)* following the enactment of SOX regulations. However, statistically significant differences were not found for board size, Tobin's Q, or M/B ratio for the sample between the pre- and post-SOX periods. As shown in Tables 4 and 5, the foreign registrants had significantly higher annual stock returns *(mean: 0.02 > 0.00; median: 0.02 > -0.01)* and earned greater ROA *(mean: 0.05 > 0.00; median 0.04 > 0.01)* in the post-SOX period compared to the pre-SOX period, and variance in the post-SOX SDNI_SDOCF$_{i,t}$ ratio reported by the foreign registrants was significantly larger than that reported during the pre-SOX period (1.52 > 0.70).

Correlation Analysis

During the pre-SOX period, no statistically significant correlations were noted between either the number of directors sitting on firm boards (BZ$_{i,t}$) or the proportion of independent directors on firm boards (BI$_{i,t}$) and the corporate performance measures Comp_Ret$_{i,t}$, Ln(Tobin's Q(1)$_{i,t}$), Ln(Tobin's Q(2)$_{i,t}$), or Ln(M/B Ratio $_{i,t}$) (Table 6). For the period following SOX enactment, significant and negative Pearson correlations (γ) were found between the number of directors sitting on boards (BZ$_{i,t}$) and both Ln(Tobin's Q(1)$_{i,t}$) *(γ = -0.19)* and Ln(Tobin's Q(2)$_{i,t}$) *(γ = -0.17)* (Table 6). Spearman correlation results (rho) confirmed a statistically significant and negative correlation between BZ$_{i,t}$ and Ln(Tobin's Q(1)$_{i,t}$) *(rho$_{TQ1}$ = -0.17)* (Table 7). Also, significant and positive correlations were found between the proportion of independent directors on the foreign registrants' boards (BI$_{i,t}$) and Ln(Tobin's Q(1)$_{i,t}$) *(γ = 0.22)*, Ln(Tobin's Q(2)$_{i,t}$) *(γ = 0.22)*, and Ln(M/B Ratio $_{i,t}$) *(γ =0.20)*.

	Table 2					
DESCRIPTIVE STATISTICS : COMPARISON OF FIRM-YEAR VARIABLES DATA BETWEEN THE PRE-SOX AND THE POST-SOX GROUPS						
	Pre-SOX Period (Year 1998 - Year 2001)			*Post-SOX Period (Year 2003 - Year 2008)*		
Variables	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Comp_Ret $_{i,t}$	0.00	-0.01	0.04	0.02	0.02	0.03
Tobin's Q(1) $_{i,t}$	8.93	0.83	39.65	12.00	1.02	66.58
Ln (Tobin's Q(1) $_{i,t}$)	0.22	-0.19	1.33	0.25	0.02	1.18
Tobin's Q(2) $_{i,t}$	9.29	1.27	39.63	12.34	1.42	66.55
Ln (Tobin's Q(2) $_{i,t}$)	0.58	0.24	1.16	0.57	0.35	1.04
M/B Ratio $_{i,t}$	16.83	1.99	75.52	33.00	2.16	196.09
Ln (M/B Ratio $_{i,t}$)	0.81	0.69	1.45	0.90	0.77	1.36
BZ $_{i,t}$	13.31	11.00	6.52	12.83	12.00	4.94
BI $_{i,t}$	0.37	0.33	0.27	0.46	0.48	0.26
MR $_{i,t}$	-0.01	-0.08	0.26	0.15	0.14	0.12
ROA $_{i,t}$	0.01	0.02	0.08	0.05	0.04	0.06
FZ $_{i,t}$	9.02	9.68	2.11	9.01	9.31	1.90
N of observations	*316*			*395*		

Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.

Tobin's Q(1) $_{i,t}$ = (Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$)/Book value of assets $_{i,t}$

Tobin's Q(2) $_{i,t}$ = Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$

M/B Ratio $_{i,t}$ = Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$

BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.

FZ $_{i,t}$ = Logrithm of market capitalization of a foreign registrant (i) in the period t.

	Table 3					
TESTS FOR DIFFERENCES IN FIRM-YEAR VARIABLES DATA BETWEEN THE PRE-SOX AND THE POST-SOX GROUPS						
	Levene Test		t Test		Mann-Whitney Test	
Variables[a]	F statistic	Significance[*]	t statistic	Significance[*]	Z statistic	Asymetric Significance[*]
Comp_Ret $_{i,t}$	17.68	*0.00*	-4.55	*0.00*	-4.350	*0.00*
Tobin's Q(1) $_{i,t}$	0.49	*0.48*	-0.32	*0.75*	-1.094	*0.27*
Ln (Tobin's Q(1) $_{i,t}$)	2.04	*0.16*	-0.16	*0.88*	-1.094	*0.27*
Tobin's Q(2) $_{i,t}$	0.50	*0.48*	-0.32	*0.75*	-0.914	*0.36*
Ln (Tobin's Q(2) $_{i,t}$)	1.69	*0.20*	0.06	*0.95*	-0.914	*0.36*
M/B Ratio $_{i,t}$	1.50	*0.22*	-0.59	*0.56*	-0.734	*0.46*
Ln (M/B Ratio $_{i,t}$)	1.41	*0.24*	-0.41	*0.68*	-0.734	*0.46*
BZ $_{i,t}$	2.66	*0.11*	0.56	*0.58*	-0.057	*0.96*
BI $_{i,t}$	0.03	*0.86*	-2.10	*0.04*	-2.216	*0.03*
MR $_{i,t}$	20.40	*0.00*	-5.75	*0.00*	-7.025	*0.00*
ROA $_{i,t}$	3.98	*0.05*	-4.05	*0.00*	-3.062	*0.00*
FZ $_{i,t}$	1.53	*0.22*	0.03	*0.97*	-0.065	*0.95*

Notes:

[a.] Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.

Tobin's Q(1) $_{i,t}$ = (Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$) /Book value of assets $_{i,t}$

Tobin's Q(2) $_{i,t}$ = Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$

M/B Ratio $_{i,t}$ = Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$

BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.

FZ $_{i,t}$ = Logrithm of market capitalization of a foreign registrant (i) in the period t.

* $p < .05$.

	Table 4					
DESCRIPTIVE STATISTICS: COMPARISON OF FIRM-LEVEL VARIABLES DATA BETWEEN THE PRE-SOX AND THE POST-SOX GROUPS						
	Pre-SOX Period (Year 1998 - Year 2001)			*Post-SOX Period (Year 2003 - Year 2008)*		
Variables	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Comp_Ret $_{i,t}$	0.00	-0.01	0.03	0.02	0.02	0.01
Tobin's Q(1) $_{i,t}$	1.37	0.83	1.46	1.38	0.94	1.25
Ln (Tobin's Q(1) $_{i,t}$)	-0.06	-0.19	0.84	0.09	-0.06	0.64
Tobin's Q(2) $_{i,t}$	1.73	1.20	1.42	1.72	1.34	1.20
Ln (Tobin's Q(2) $_{i,t}$)	0.31	0.18	0.66	0.40	0.29	0.50
M/B Ratio $_{i,t}$	2.61	1.66	3.00	16.42	2.15	75.26
Ln (M/B Ratio $_{i,t}$)	0.49	0.51	1.00	0.88	0.76	1.17
BZ $_{i,t}$	12.96	11.33	5.51	12.78	11.80	4.83
BI $_{i,t}$	0.36	0.28	0.24	0.45	0.45	0.25
SDNI_SDOCF$_{i,t}$	1.06	0.82	0.70	1.46	0.89	1.52
MCA_OCF$_{i,t}$	2.25	0.85	4.97	2.14	0.71	3.50
COR(NI_OCF)$_{i,t}$	-0.02	-0.14	0.51	0.15	0.22	0.66
MR $_{i,t}$	-0.05	-0.08	0.09	0.15	0.15	0.03
ROA $_{i,t}$	0.00	0.01	0.09	0.05	0.04	0.05
FZ $_{i,t}$	8.44	8.94	2.24	8.98	9.24	1.87
N of observations	*79*			*79*		

Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.

Tobin's Q(1) $_{i,t}$ = (Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$) / Book value of assets $_{i,t}$

Tobin's Q(2) $_{i,t}$ = Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$

M/B Ratio $_{i,t}$ = Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$

BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

SDNI_SDOCF $_{i,t}$ = Standard deviation of net income $_{i,t}$ / Standard deviation of operating cash flows $_{i,t}$

MCA_OCF $_{i,t}$ = Median of the absolute value of current accruals $_{i,t}$ / operating cash flows $_{i,t}$

COR(NI_OCF)$_{i,t}$ = Correlation between current accruals and operating cash flows of a foreign registrant (i) in the period t.

MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.

FZ $_{i,t}$ = Logrithm of market capitalization of a foreign registrant (i) in the period t.

	Levene Test		t Test		Mann-Whitney Test	
Variables[a]	F statistic	Significance[*]	t statistic	Significance[*]	Z statistic	Asymetric Significance*
Comp_Ret $_{i,t}$	8.89	*0.00*	-4.28	*0.00*	-4.17	*0.00*
Tobin's Q(1) $_{i,t}$	0.66	*0.42*	-0.01	*0.99*	-1.01	*0.32*
Ln (Tobin's Q(1) $_{i,t}$)	0.92	*0.34*	-0.75	*0.46*	-1.01	*0.32*
Tobin's Q(2) $_{i,t}$	0.87	*0.36*	0.01	*0.99*	-1.36	*0.18*
Ln (Tobin's Q(2) $_{i,t}$)	0.95	*0.33*	-0.57	*0.57*	-1.36	*0.18*
M/B Ratio $_{i,t}$	3.57	*0.06*	-0.97	*0.34*	-1.21	*0.23*
Ln (M/B Ratio $_{i,t}$)	0.260	*0.61*	-1.35	*0.18*	-1.21	*0.23*
BZ $_{i,t}$	5.04×10^{-5}	*0.99*	0.13	*0.89*	-0.07	*0.94*
BI $_{i,t}$	0.38	*0.54*	-1.32	*0.19*	-1.39	*0.17*
SDNI_SDOCF $_{i,t}$	7.61	*0.01*	-1.26	*0.21*	-0.16	*0.87*
MCA_OCF $_{i,t}$	0.01	*0.94*	0.11	*0.92*	-0.51	*0.61*
COR(NI_OCF) $_{i,t}$	2.880	*0.10*	-1.07	*0.29*	-1.15	*0.25*
MR $_{i,t}$	22.39	*0.00*	-11.35	*0.00*	-6.17	*0.00*
ROA $_{i,t}$	4.04	*0.05*	-2.79	*0.01*	-2.43	*0.02*
FZ $_{i,t}$	2.72	*0.11*	-0.99	*0.33*	-0.85	*0.40*

Table 5
TESTS FOR DIFFERENCES IN FIRM LEVEL VARIABLES DATA BETWEEN THE PRE-SOX AND THE POST-SOX GROUPS

Notes:

[a.] Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.

Tobin's Q(1) $_{i,t}$ = (Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$) /Book value of assets $_{i,t}$

Tobin's Q(2) $_{i,t}$ = Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$

M/B Ratio $_{i,t}$ = Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$

BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

SDNI_SDOCF $_{i,t}$ = Standard deviation of net income $_{i,t}$ / Standard deviation of operating cash flows $_{i,t}$

MCA_OCF $_{i,t}$ = Median of the absolute value of current accruals $_{i,t}$ / operating cash flows $_{i,t}$

COR(NI_OCF) $_{i,t}$ = Correlation between current accruals and operating cash flows of a foreign registrant (i) in the period t.

MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.

FZ $_{i,t}$ = Logrithm of market capitalization of a foreign registrant (i) in the period t.

* p < .05.

As shown in Table 8, Pearson correlation (γ) results for firm-level variable data indicate that the stronger the correlation between net income and operating cash flow ($COR(NI\_OCF)_{i,t}$), the poorer the corporate performance ($Ln(M/B$ $Ratio$ $_{i,t})$) during the pre-SOX period ($\gamma = -0.40$); however, during the post-SOX period, the higher the $COR(NI\_OCF)_{i,t}$, the better the $Ln(Tobin's$ $Q(1)_{i,t})$ and $Ln(Tobin's$ $Q(2)_{i,t})$ values ($\gamma_{TQ1} = 0.44$; $\gamma_{TQ2} = 0.42$). Results from a Spearman correlation (rho) analysis of firm-level variable data support the Pearson findings for the same data (Table 9) ($rho = -0.36$ vs. $rho_{TQ1} = 0.46$ / $rho_{TQ2} = 0.39$).

Tests for Hypotheses

The average number of directors sitting on the boards of foreign registrants was approximately thirteen during both the pre- and post-SOX periods (Table 2). Our findings indicate that any increase in board size following SOX enactment exerted a significantly negative effect on corporate performance *($\gamma = -0.19$; rho = -0.17)*. All other factors unchanged, any improvement on corporate performance from increased board size following SOX enactment was not statistically significant (Table 10). Accordingly, the *Hypothesis 1* is rejected.

Post-SOX enactment, the average proportion of independent directors on the boards of the foreign registrants in our sample increased significantly, from 37% (33%) to 46% (48%) (Tables 2 and 3). Also post-SOX, increased proportions of independent directors on the boards of the sample firms were significantly and positively correlated with corporate performance- with $Ln(Tobin's$ $Q(1)_{i,t}$ by the coefficient 0.22, with $Ln(Tobin's$ $Q(2)_{i,t})$ by the coefficient 0.22 , and with $Ln(M/B$ $Ratio$ $_{i,t}$ by the coefficient 0.20, respectively (Tables 6 and 7). Furthermore, other factors being equal, independent director proportion had no significant impact on any of the corporate performance measures during the pre-SOX period (Table 10), but after SOX enactment, increased independent director proportion resulted in significant improvement in $Ln(Tobin's$ $Q(1)_{i,t})$ *(coefficient increases significantly from 1.03 to 1.04)*, $Ln(Tobin's$ $Q(2)_{i,t})$*(coefficient increases significantly from 0.87 to 0.88)* , and $Ln(M/B$ $Ratio$ $_{i,t})$*(coefficient increases significantly from 0.71 to 1.19)*. Therefore, *Hypothesis 2* is supported.

Coefficient (γ)	Comp_Ret $_{i,t}$	Ln (Tobin's Q(1) $_{i,t}$)	Ln (Tobin's Q(2) $_{i,t}$)	Ln (M/B Ratio $_{i,t}$)	BZ $_{i,t}$	BI $_{i,t}$	MR $_{i,t}$	ROA $_{i,t}$	FZ $_{i,t}$	
Table 6										
PEARSON CORRELATION ANALYSIS OF FIRM-YEAR VARIABLES DATA										
Comp_Ret $_{i,t}$	**1.00**	0.16*	0.15	0.16*	0.02	-0.03	0.37**	-0.12	-0.14	
(significance)	-	*(0.05)*	*(0.06)*	*(0.05)*	*(0.86)*	*(0.76)*	*(0.00)*	*(0.16)*	*(0.10)*	
Ln (Tobin's Q(1) $_{i,t}$)	0.23	**1.00**	0.98**	0.89**	-0.19*	0.22**	-0.03	0.27**	-0.06	
(significance)	*(0.10*	-	*(0.00)*	*(0.00)*	*(0.02)*	*(0.01)*	*(0.68)*	*(0.00)*	*(0.46)*	
Ln (Tobin's Q(2) $_{i,t}$)	0.23	0.99**	**1.00**	0.87**	-0.17*	0.22**	-0.02	0.21*	-0.08	
(significance)	*(0.10)*	*(0.00)*	-	*(0.00)*	*(0.04)*	*(0.01)*	*(0.78)*	*(0.01)*	*(0.35)*	
Ln (M/B Ratio $_{i,t}$)	0.22	0.96**	0.96**	**1.00**	-0.08	0.20*	-0.04	0.20*	-0.05	
(significance)	*(0.12)*	*(0.00)*	*(0.00)*	-	*(0.35)*	*(0.02)*	*(0.66)*	*(0.01)*	*(0.52)*	
BZ $_{i,t}$	0.00	-0.24	-0.21	-0.18	**1.00**	-0.25**	0.06	0.00	0.49**	
(significance)	*(0.99)*	*(0.08)*	*(0.12)*	*(0.20)*	-	*(0.00)*	*(0.46)*	*(0.99)*	*(0.00)*	
BI $_{i,t}$	0.00	0.26	0.25	0.18	-0.14	**1.00**	-0.09	-0.11	-0.06	
(significance)	*(0.98)*	*(0.05)*	*(0.07)*	*(0.19)*	*(0.31)*	-	*(0.27)*	*(0.19)*	*(0.45*	
MR $_{i,t}$	0.32	0.08	0.09	0.11	0.09	-0.02	**1.00**	-0.178*	0.00	
(significance)	*(0.02)*	*(0.57)*	*(0.50)*	*(0.43)*	*(0.51)*	*(0.91)*	-	*(0.03)*	*(0.97)*	
ROA $_{i,t}$	0.13	0.26	0.22	0.27*	-0.03	0.07	-0.09	**1.00**	0.22**	Post-SOX Period
(significance)	*(0.36)*	*(0.06)*	*(0.12)*	*(0.05)*	*(0.82)*	*(0.59)*	*(0.51)*	-	*(0.01)*	
FZ $_{i,t}$	0.06	0.17	0.16	0.29*	0.29*	0.02	0.15	0.44**	**1.00**	
(significance)	*(0.66)*	*(0.21)*	*(0.24)*	*(0.04)*	*(0.04)*	*(0.90)*	*(0.28)*	*(0.00)*	-	
Pre-SOX Period										

Notes:
*p < .05.
**p < .01.

Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.

Tobin's Q(1) $_{i,t}$ = (Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$)/Book value of assets $_{i,t}$

Tobin's Q(2) $_{i,t}$ = Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$

M/B Ratio $_{i,t}$ = Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$

BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.

FZ $_{i,t}$ = Logrithm of market capitalization of a foreign registrant (i) in the period t.

Table 7 SPEARMAN CORRELATION ANALYSIS OF FIRM-YEAR VARIABLES DATA									
Spearman's *rho*	Comp_Ret i,t	Ln (Tobin's Q(1) i,t)	Ln (Tobin's Q(2) i,t)	Ln (M/B Ratio i,t)	BZ i,t	BI i,t	MR i,t	ROA i,t	FZ i,t
Comp_Ret i,t	**1.00**	0.13	0.13	0.17*	0.06	0.00	0.41**	-0.07	-0.11
(significance)	-	*(0.11)*	*(0.11)*	*(0.03)*	*(0.51)*	*(0.99)*	*(0.00)*	*(0.41)*	*(0.17)*
Ln (Tobin's Q(1) i,t)	0.19	**1.00**	0.95**	0.84**	-0.17**	0.14	-0.06	0.49**	0.07
(significance)	*(0.18)*	-	*(0.00)*	*(0.00)*	*(0.04)*	*(0.10)*	*(0.51)*	*(0.00)*	*(0.38)*
Ln (Tobin's Q(2) i,t)	0.21	0.95**	**1.00**	0.927**	-0.13	0.06	-0.07	0.46**	0.05
(significance)	*(0.14)*	*(0.00)*	-	*(0.00)*	*(0.11)*	*(0.49)*	*(0.38)*	*(0.00)*	*(0.55)*
Ln (M/B Ratio i,t)	0.19	0.92**	0.98**	**1.00**	-0.08	0.07	-0.08	0.34**	0.02
(significance)	*(0.16)*	*(0.00)*	*(0.00)*	-	*(0.34)*	*(0.40)*	*(0.33)*	*(0.00)*	*(0.82)*
BZ i,t	0.02	-0.19	-0.21	-0.18	**1.00**	-0.21*	0.05	0.05	0.51**
(significance)	*(0.92)*	*(0.18)*	*(0.12)*	*(0.20)*	-	*(0.01)*	*(0.58)*	*(0.55)*	*(0.00)*
BI i,t	-0.08	0.21	0.25	0.18	-0.14	**1.00**	-0.02	-0.12	-0.09
(significance)	*(0.59)*	*(0.14)*	*(0.07)*	*(0.19)*	*(0.31)*	-	*(0.80)*	*(0.14)*	*(0.30)*
MR i,t	0.30*	0.12	0.19	0.11	0.13	0.18	**1.00**	-0.14	-0.02
(significance)	*(0.03)*	*(0.39)*	*(0.17)*	*(0.43)*	*(0.35)*	*(0.20)*	-	*(0.09)*	*(0.84)*
ROA	0.29*	0.46**	0.45**	0.27*	-0.18	0.06	-0.00	**1.00**	0.31*
(significance)	*(0.03)*	*(0.00)*	*(0.00)*	*(0.05)*	*(0.20)*	*(0.66)*	*(0.99)*	-	*(0.00)*
FZ i,t	-0.04	0.30**	0.34*	0.29*	0.27	0.01	0.27*	0.28*	**1.00**
(significance)	*(0.77)*	*(0.03)*	*(0.01)*	*(0.04)*	*(0.05)*	*(0.95)*	*(0.05)*	*(0.04)*	-
Pre-SOX Period									

Notes:

*p < .05.

**p < .01.

Comp_Ret i,t = annual stock return of a foreign registrant (i) in the period t.

Tobin's Q(1) i,t = (Market value of common shares i,t + Book value of preferred shares i,t + Long-term debts i,t)/Book value of assets i,t

Tobin's Q(2) i,t = Market value of assets i,t / Book value of assets i,t

M/B Ratio i,t = Market value of common stockholders' equity i,t / Book value of common stockholders' equity i,t

BZ i,t = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI i,t = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

MR i,t = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA i,t = Return on total assets of a foreign registrant (i) in the period t.

FZ i,t = Logrithm of market capitalization of a foreign registrant (i) in the period t.

(The right margin of the table is labeled "Post-SOX Period")

Table 8
PEARSON CORRELATION ANALYSIS OF FIRM LEVEL VARIABLES DATA

Coefficient (γ)	Comp_Ret $_{i,t}$	Ln (Tobin's Q(1) $_{i,t}$)	Ln (Tobin's Q(2) $_{i,t}$)	Ln (M/B Ratio $_{i,t}$)	SDNI_SDOCF$_{i,t}$	MCA_OCF$_{i,t}$	COR(NI_OCF)$_{i,t}$	BZ $_{i,t}$	BI $_{i,t}$	MR $_{i,t}$	ROA $_{i,t}$	FZ $_{i,t}$	
Comp_Ret $_{i,t}$	**1.00**	0.07	0.06	0.16	0.10	0.04	0.19	0.10	-0.12	-0.02	0.04	-0.329	
(significance)	-	*(0.73)*	*(0.75)*	*(0.42)*	*(0.62)*	*(0.83)*	*(0.32)*	*(0.59)*	*(0.52)*	*(0.94)*	*(0.83)*	*(0.08)*	
Ln (Tobin's Q(1) $_{i,t}$)	-0.07	**1.00**	0.96**	0.63**	-0.29	-0.27	0.44*	-0.15	-0.00	-0.45**	0.60**	0.02	
(significance)	*(0.74)*	-	*(0.00)*	*(0.00)*	*(0.12)*	*(0.16)*	*(0.02)*	*(0.43)*	*(0.99)*	*(0.02)*	*(0.00)*	*(0.92)*	
Ln (Tobin's Q(2) $_{i,t}$)	-0.08	0.97**	**1.00**	0.67**	-0.41	-0.26	0.42*	-0.11	-0.06	-0.46*	0.54**	0.01	
(significance)	*(0.70)*	*(0.00)*	-	*(0.00)*	*(0.03)*	*(0.18)*	*(0.02)*	*(0.59)*	*(0.76)*	*(0.01)*	*(0.00)*	*(0.96)*	
Ln (M/B Ratio $_{i,t}$)	-0.11	0.93**	0.94**	**1.00**	-0.31	-0.21	0.36	0.06	0.01	-0.18	0.47*	0.04	
(significance)	*(0.58)*	*(0.00)*	*(0.00)*	-	*(0.11)*	*(0.28)*	*(0.05)*	*(0.77)*	*(0.96)*	*(0.35)*	*(0.01)*	*(0.84)*	
SDNI_SDOCF$_{i,t}$	-0.27	0.19	0.22	0.16	**1.00**	0.08	0.08	-0.03	0.14	0.00	-0.30	0.02	Post-SOX Period
(significance)	*(0.16)*	*(0.32)*	*(0.26)*	*(0.42)*	-	*(0.68)*	*(0.67)*	*(0.86)*	*(0.49)*	*(0.99)*	*(0.11)*	*(0.90)*	
MCA_OCF$_{i,t}$	-0.14	0.36	0.37	0.25	0.57**	**1.00**	-0.13	-0.32	0.14	0.17	-0.35	-0.55**	
(significance)	*(0.48)*	*(0.06)*	*(0.05)*	*(0.20)*	*(0.00)*	-	*(0.51)*	*(0.09)*	*(0.46)*	*(0.39)*	*(0.06)*	*(0.00)*	
COR(NI_OCF)$_{i,t}$	-0.09	-0.26	-0.27	-0.40*	0.33	0.28	**1.00**	-0.11	0.25	-0.10	0.16	0.02	
(significance)	*(0.66)*	*(0.19)*	*(0.17)*	*(0.04)*	*(0.08)*	*(0.16)*	-	*(0.59)*	*(0.21)*	*(0.59)*	*(0.40)*	*(0.94)*	
BZ $_{i,t}$	0.03	-0.12	-0.10	0.00	-0.42*	-0.23	-0.17	**1.00**	-0.26	0.26	0.04	0.46*	
(significance)	*(0.89)*	*(0.56)*	*(0.62)*	*(0.99)*	*(0.03)*	*(0.24)*	*(0.38)*	-	*(0.18)*	*(0.18)*	*(0.85)*	*(0.01)*	
BI $_{i,t}$	0.03	0.19	0.22	0.14	-0.03	-0.13	0.01	-0.14	**1.00**	-0.15	-0.16	-0.11	
(significance)	*(0.89)*	*(0.34)*	*(0.26)*	*(0.47)*	*(0.90)*	*(0.53)*	*(0.94)*	*(0.47)*	-	*(0.45)*	*(0.41)*	*(0.58)*	
MR $_{i,t}$	0.21	0.24	0.27	0.34	-0.02	-0.35	-0.13	0.26	0.01	**1.00**	-0.05	0.19	
(significance)	*(0.27)*	*(0.22)*	*(0.17)*	*(0.08)*	*(0.93)*	*(0.07)*	*(0.51)*	*(0.18)*	*(0.95)*	-	*(0.78)*	*(0.33)*	
ROA $_{i,t}$	0.08	0.24	0.14	0.26	-0.28	-0.52**	-0.22	0.04	0.02	0.32	**1.00**	0.28	
(significance)	*(0.70)*	*(0.23)*	*(0.49)*	*(0.19)*	*(0.15)*	*(0.01)*	*(0.27)*	*(0.85)*	*(0.91)*	*(0.10)*	-	*(0.14)*	
FZ $_{i,t}$	-0.07	0.39*	0.34	0.49**	-0.31	-0.35	-0.41*	0.39*	0.04	0.52**	0.49**	**1.00**	
(significance)	*(0.73)*	*(0.04)*	*(0.08)*	*(0.01)*	*(0.11)*	*(0.07)*	*(0.03)*	*(0.04)*	*(0.84)*	*(0.00)*	*(0.01)*	-	
Pre-SOX Period													

Notes:
*p < .05.
**p < .01.
Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.
Ln(Tobin's Q(1) $_{i,t}$) = Ln [(Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$)/Book value of assets $_{i,t}$]
Ln(Tobin's Q(2) $_{i,t}$) = Ln (Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$)
Ln(M/B Ratio $_{i,t}$) = Ln (Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$)
BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.
BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.
SDNI_SDOCF $_{i,t}$ = Standard deviation of net income $_{i,t}$ / Standard deviation of operating cash flows $_{i,t}$
MCA_OCF $_{i,t}$ = Median of the absolute value of current accruals $_{i,t}$ / operating cash flows $_{i,t}$
COR(NI_OCF) $_{i,t}$ = Correlation between current accruals and operating cash flows of a foreign registrant (i) in the period t.
MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.
ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.
FZ $_{i,t}$ = Logrithm of market capitalization of a foreign registrant (i) in the period t.

Spearman's *rho*	Comp_Ret	Tobin's Q	Tobin's Q	M/B Ratio	SDNI_SDOCF$_{i,t}$	MCA_OCF$_{i,t}$	COR(NI_OCF)$_{i,t}$	BZ$_{i,t}$	BI$_{i,t}$	MR$_{i,t}$	ROA$_{i,t}$	FZ$_{i,t}$	
Comp_Ret$_{i,t}$	**1.00**	0.02	0.07	0.12	0.18	0.14	0.24	0.18	-0.02	-0.16	0.07	-0.37*	
(significance)	-	*(0.90)*	*(0.71)*	*(0.55)*	*(0.36)*	*(0.47)*	*(0.21)*	*(0.35)*	*(0.94)*	*(0.41)*	*(0.72)*	*(0.05)*	
Ln (Tobin's Q(1)$_{i,t}$)	0.01	**1.00**	0.92**	0.81	-0.15	-0.22	0.46*	-0.20	0.04	-0.11	0.59**	0.06	
(significance)	*(0.98)*	-	*(0.00)*	*(0.00)*	*(0.43)*	*(0.25)*	*(0.01)*	*(0.29)*	*(0.83)*	*(0.57)*	*(0.00)*	*(0.76)*	
Ln (Tobin's Q(2)$_{i,t}$)	0.06	0.94**	**1.00**	0.94**	-0.28	-0.35	0.39*	-0.11	-0.05	-0.17	0.59**	0.08	
(significance)	*(0.76)*	*(0.00)*	-	*(0.00)*	*(0.15)*	*(0.06)*	*(0.04)*	*(0.56)*	*(0.79)*	*(0.37)*	*(0.00)*	*(0.70)*	
Ln (M/B Ratio$_{i,t}$)	-0.03	0.93**	0.97**	**1.00**	-0.29	-0.26	0.33	-0.07	-0.06	-0.20	0.47**	0.01	
(significance)	*(0.90)*	*(0.00)*	*(0.00)*	-	*(0.13)*	*(0.18)*	*(0.08)*	*(0.74)*	*(0.78)*	*(0.31)*	*(0.01)*	*(0.95)*	
SDNI_SDOCF$_{i,t}$	-0.19	-0.05	-0.08	-0.13	**1.00**	0.17	0.17	-0.08	0.24	0.09	-0.09	-0.13	
(significance)	*(0.33)*	*(0.78)*	*(0.70)*	*(0.52)*	-	*(0.38)*	*(0.39)*	*(0.69)*	*(0.20)*	*(0.66)*	*(0.63)*	*(0.50)*	Post-SOX Period
MCA_OCF$_{i,t}$	-0.26	-0.26	-0.24	-0.23	0.48**	**1.00**	-0.08	-0.22	-0.03	0.31	-0.18	-0.40*	
(significance)	*(0.19)*	*(0.18)*	*(0.21)*	*(0.24)*	*(0.01)*	-	*(0.70)*	*(0.25)*	*(0.87)*	*(0.10)*	*(0.35)*	*(0.03)*	
COR(NI_OCF)$_{i,t}$	-0.01	-0.30	-0.32	-0.36	0.37	0.32	**1.00**	-0.11	0.24	-0.17	0.03	0.07	
(significance)	*(0.96)*	*(0.13)*	*(0.10)*	*(0.06)*	*(0.05)*	*(0.10)*	-	*(0.59)*	*(0.22)*	*(0.39)*	*(0.86)*	*(0.71)*	
BZ$_{i,t}$	0.07	-0.03	-0.03	0.07	-0.64**	-0.24	-0.35	**1.00**	-0.21	0.01	0.03	0.47*	
(significance)	*(0.72)*	*(0.87)*	*(0.90)*	*(0.74)*	*(0.00)*	*(0.22)*	*(0.07)*	-	*(0.28)*	*(0.94)*	*(0.89)*	*(0.01)*	
BI$_{i,t}$	-0.01	0.06	0.08	0.05	0.11	-0.29	-0.04	-0.14	**1.00**	-0.09	-0.28	-0.17	
(significance)	*(0.95)*	*(0.75)*	*(0.67)*	*(0.81)*	*(0.57)*	*(0.14)*	*(0.84)*	*(0.47)*	-	*(0.64)*	*(0.14)*	*(0.39)*	
MR$_{i,t}$	0.26	0.32	0.40*	0.41*	-0.03	-0.14	-0.06	0.14	-0.02	**1.00**	0.18	0.02	
(significance)	*(0.17)*	*(0.10)*	*(0.03)*	*(0.03)*	*(0.89)*	*(0.49)*	*(0.75)*	*(0.49)*	*(0.94)*	-	*(0.35)*	*(0.91)*	
ROA$_{i,t}$	0.35	0.37	0.31	0.30	-0.17	-0.60**	-0.19	-0.03	0.03	0.11	**1.00**	0.30	
(significance)	*(0.07)*	*(0.06)*	*(0.11)*	*(0.12)*	*(0.40)*	*(0.00)*	*(0.34)*	*(0.89)*	*(0.89)*	*(0.58)*	-	*(0.12)*	
FZ$_{i,t}$	-0.02	0.44*	0.43*	0.51**	-0.28	-0.52**	-0.35	0.42*	0.04	0.47*	0.34	**1.00**	
(significance)	*(0.92)*	*(0.02)*	*(0.02)*	*(0.01)*	*(0.15)*	*(0.00)*	*(0.07)*	*(0.03)*	*(0.86)*	*(0.01)*	*(0.08)*	-	
Pre-SOX Period													

Table 9
SPEARMAN CORRELATION ANALYSIS OF FIRM LEVEL VARIABLES DATA

Notes:
*p < .05.
**p < .01.

Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.

Ln(Tobin's Q(1) $_{i,t}$) = Ln [(Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$)
/Book value of assets $_{i,t}$]

Ln(Tobin's Q(2) $_{i,t}$) = Ln (Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$)

Ln(M/B Ratio $_{i,t}$) = Ln (Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$)

BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

SDNI_SDOCF $_{i,t}$ = Standard deviation of net income $_{i,t}$ / Standard deviation of operating cash flows $_{i,t}$

MCA_OCF $_{i,t}$ = Median of the absolute value of current accruals $_{i,t}$ / operating cash flows $_{i,t}$

COR(NI_OCF)$_{i,t}$ = Correlation between current accruals and operating cash flows of a foreign registrant (i) in the period t.

MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.

FZ $_{i,t}$ = Logrithm of market capitalization of a foreign registrant (i) in the period t.

<table>
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CROSS-SECTIONAL REGRESSION OF CORPORAET PERFORMANCE ON BOARD SIZE AND BOARD INDEPENDENCE: COMPARISON BETWEEN THE PRE-SOX FINDINGS AND THE POST-SOX FINDINGS

Performance Variable[a]	Comp_Ret $_{i,t}$			Ln (Tobin's Q(1) $_{i,t}$)			Ln (Tobin's Q(2) $_{i,t}$)			Ln (M/B Ratio $_{i,t}$)		
Variables[b]	Predicted Sign	Pre-SOX	Post-SOX	Predicted Sign	Pre-SOX	Post-SOX	Predicted Sign	Pre-SOX	Post-SOX	Predicted Sign	Pre-SOX	Post-SOX
Intercept		0.01	0.03**		-0.44	0.16		-0.07	0.56		-0.62	0.68
(*t* statistic)[c]		(0.37)	(2.15)		(-0.51)	(0.34)		(-0.09)	(1.29)		(-0.65)	(1.18)
BZ $_{i,t}$	+	4.25×10^{-5}	4.42×10^{-4}	+	-0.05	-0.03	+	-0.04	-0.02	+	-0.05	0.01
(*t* statistic)		(-0.04)	(0.88)		(-1.87)	(-1.16)		(-1.63)	(-0.83)		-(1.72)	(0.33)
BI $_{i,t}$	+	-0.002	0.00	+	1.03	1.04**	+	0.87	0.88**	+	0.71	1.19**
(*t* statistic)		(-0.09)	(0.19)		(1.63)	(2.86)		(1.55)	(2.69)		(1.02)	(2.74)
MR $_{i,t}$	+	0.06**	0.08**									
(*t* statistic)		(2.48)	(4.60)									
ROA $_{i,t}$	+	0.10	-0.01	+	2.60	5.78**	+	1.62	4.23**	+	2.11	5.49**
(*t* statistic)		(1.22)	(-0.13)		(1.13)	(3.82)		(0.79)	(3.09)		(0.84)	(3.04)
FZ $_{i,t}$	+/-	-0.001	-0.002	+/-	0.11	-0.04	+/-	0.10	-0.04	+/-	0.21	-0.08
(*t* statistic)		(-0.43)	(-1.88)		(1.12)	-(0.69)		(1.11)	(-0.87)		(1.97)	(-1.17)
N of Observations		316	395		316	395		316	395		316	395
Adj. R^2		0.04	0.13		0.13	0.13		0.08	0.10		0.12	0.07
F statistic[d]		1.41	5.36*		2.90*	6.68*		2.22	4.91*		2.77*	3.94*
(significance)		(0.24)	(0.00)		(0.03)	(0.00)		(0.08)	(0.00)		(0.04)	(0.01)

Notes:

[a.] Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.

Ln(Tobin's Q(1) $_{i,t}$) = Ln [(Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$)/Book value of assets $_{i,t}$]

Ln(Tobin's Q(2) $_{i,t}$) = Ln [Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$]

Ln(M/B Ratio $_{i,t}$) = Ln [Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$]

[b.] BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.

FZ $_{i,t}$ = Natural logrithm of market capitalization of a foreign registrant (i) in the period t.

[c.] The symbol "**" denotes that the coefficient is significant as the *p-value* of its t-statistic is less than two-tailed 5% level.

[d.] The symbol "*" denotes that the F statistic is significant as its *p-value* is less than two-tailed 5% level.

		Comp_Ret $_{i,t}$			Ln (Tobin's Q(1) $_{i,t}$)			Ln (Tobin's Q(2) $_{i,t}$)			Ln (M/B Ratio $_{i,t}$)	
Performance Variable [a] *Variables* [b]	Predicted Sign	Pre-SOX	Post-SOX	Predicted Sign	Pre-SOX	Post-SOX	Predicted Sign	Pre-SOX	Post-SOX	Predicted Sign	Pre-SOX	Post-SOX
Intercept		0.08	0.04**		-1.77**	0.60		-1.12	0.91		-1.99**	1.06
(*t* statistic) [c]		(2.02)	(2.65)		(-2.76)	(0.94)		(-2.04)	(1.78)		(-2.62)	(0.77)
BZ $_{i,t}$	+	-5.22 ΄ 10^{-4}	0.00	+	-0.02	-0.02	+	-0.01	-0.01	+	-0.002	0.03
(*t* statistic)		(-0.42)	(1.46)		(-0.63)	(-0.73)		(-0.35)	(-0.53)		(-0.05)	(0.64)
BI $_{i,t}$	+	0.01	-0.01	+	0.85	-0.03	+	0.79	-0.14	+	0.83	0.23
(*t* statistic)		(0.20)	(-0.66)		(1.76)	(-0.07)		(1.90)	(-0.42)		(1.45)	(0.26)
SDNI_SDOCF $_{i,t}$	-	-0.02	0.00	-	0.06	-0.07	-	0.10	-0.10	-	0.25	-0.16
(*t* statistic)		(-1.88)	(0.91)		(0.29)	(-1.03)		(0.54)	(-1.92)		(0.99)	(-1.14)
MCA_OCF $_{i,t}$	-	0.00	-3.58 ΄ 10^{-4}	-	0.13**	-0.03	-	0.09**	-0.02	-	0.12**	-0.03
(*t* statistic)		(0.82)	(-0.45)		(4.02)	(-0.89)		(3.44)	(-0.83)		(3.24)	(-0.34)
COR(NI_OCF) $_{i,t}$	+	-0.01	0.00	+	-0.42	0.34**	+	-0.38	0.29**	+	-0.73**	0.57
(*t* statistic)		(-0.44)	(1.08)		(-1.66)	(2.19)		('-1.77)	(2.35)		(-2.45)	(1.70)
MR $_{i,t}$	+	0.17	0.02									
(*t* statistic)		(2.02)	(0.22)									
ROA $_{i,t}$	+	0.03	0.04	+	3.50**	6.01**	+	1.98	3.53**	+	3.41	8.37
(*t* statistic)		(0.38)	(0.76)		(2.14)	(2.85)		(1.41)	(2.10)		(1.76)	(1.84)
FZ $_{i,t}$	+/-	-0.01	-0.004**	+/-	0.15**	-0.05	+/-	0.11	-0.04	+/-	0.20**	-0.10
(*t* statistic)		-1.61	(-2.44)		(2.22)	(-0.79)		(1.91)	(-0.72)		(2.47)	(-0.70)
N of Observations		79.00	79.00		79.00	79.00		79.00	79.00		79.00	79.00
Adj. R^2		-0.040	0.04		0.52	0.40		0.44	0.38		0.53	0.16
F statistic [d]		0.87	1.14		5.133*	3.696*		4.05*	3.45*		5.27*	1.76
(significance)		*(0.557)*	*(0.379)*		*(0.002)*	*(0.009)*		*(0.01)*	*(0.01)*		*(0.00)*	*(0.15)*

Table 11

PANEL REGRESSION OF CORPORAET PERFORMANCE ON BOARD SIZE, BOARD INDEPENDENCE AND DISCLOSURE QUALITY: COMPARISON BETWEEN THE PRE-SOX FINDINGS AND THE POST-SOX FINDINGS

Notes:

[a]. Comp_Ret $_{i,t}$ = annual stock return of a foreign registrant (i) in the period t.

Ln(Tobin's Q(1) $_{i,t}$) = Ln [(Market value of common shares $_{i,t}$ + Book value of preferred shares $_{i,t}$ + Long-term debts $_{i,t}$)/Book value of assets $_{i,t}$]

Ln(Tobin's Q(2) $_{i,t}$) = Ln [Market value of assets $_{i,t}$ / Book value of assets $_{i,t}$]

Ln(M/B Ratio $_{i,t}$) = Ln [Market value of common stockholders' equity $_{i,t}$ / Book value of common stockholders' equity $_{i,t}$]

[b]. BZ $_{i,t}$ = Number of directors sitting on the board of a foreign registrant (i) in the period t.

BI $_{i,t}$ = Fraction of independent directors sitting on the board of a foreign registrant (i) in the period t.

SDNI_SDOCF $_{i,t}$ = Standard deviation of net income $_{i,t}$ / Standard deviation of operating cash flows $_{i,t}$

MCA_OCF $_{i,t}$ = Median of the absolute value of current accruals $_{i,t}$ / operating cash flows $_{i,t}$

COR(NI_OCF) $_{i,t}$ = Correlation between current accruals and operating cash flows of a foreign registrant (i) in the period t.

MR $_{i,t}$ = Index return of NASDAQ, NYSE or ASE on which a foreign registrant (i) 's shares are cross-listed.

ROA $_{i,t}$ = Return on total assets of a foreign registrant (i) in the period t.

FZ $_{i,t}$ = Natural logrithm of market capitalization of a foreign registrant (i) in the period t.

[c]. The symbol "**" denotes that the coefficient is significant as the *p-value* of its t-statistic is less than two-tailed 5% level.

[d]. The symbol "*" denotes that the F statistic is significant as its *p-value* is less than two-tailed 5% level.

Regarding disclosure quality, all other factors unchanged, $MCA\_OCF_{i,t}$ exerted a statistically significant and positive influence on pre-SOX Ln(Tobin's $Q(1)_{i,t}$) *(coefficient 0.13)*, Ln(Tobin's $Q(2)_{i,t}$), *(coefficient 0.09)* and Ln(M/B Ratio $_{i,t}$) *(coefficient 0.12)* (Table 11), implying significant increases in firm value through adjusting upward income-increasing current accruals or adjusting downward income-decreasing current accruals. In the post-SOX period, negative but statistically insignificant correlations were noted between $MCA\_OCF_{i,t}$ and Ln(Tobin's $Q(1)_{i,t}$) *(coefficient -0.03)*, Ln(Tobin's $Q(2)_{i,t}$) *(coefficient -0.02)* and Ln(M/B Ratio $_{i,t}$) *(coefficient -0.03)*, implying a declining trend in earnings management with current accruals after complying with the SOX regulations.

All other factors being equal, significant and positive correlations were found between $COR(NI\_OCF)_{i,t}$ and both Ln(Tobin's $Q(1)_{i,t}$) *(coefficient 0.34)* and Ln(Tobin's $Q(2)_{i,t}$) *(coefficient 0.29)* during the post-SOX period—that is, foreign registrants that complied with SOX Act rules reported net incomes that were closer to operating cash flows due to reduced earnings management, which in turn increased firm value and investor confidence in financial reporting quality. This finding is consistent with the finding regarding $MCA\_OCF_{i,t}$, therefore *Hypothesis 3* is supported.

SUMMARY AND CONCLUSION

A significant decline has been reported in the number of cross-listed foreign registrants in US stock markets since enactment of the Sarbanes-Oxley Act, yet few researchers have explored the specifics of how foreign registrants have been affected. Our findings indicate that, all other factors being equal, board size increases among foreign registrants failed to trigger significant improvement in share return and firm value following SOX enactment. We also found that an increase in board size might exert a statistically insignificant and negative effect on firm value, implying a maximum board size for sustaining post-SOX firm value. Consistent with findings reported by other researchers, our data support the idea that increases in the proportions of independent directors on foreign registrant boards resulted in significant improvement in post-SOX firm value. Also, we found that foreign registrant compliance with SOX regulations significantly deterred the conduct of earnings management, which in turn significantly improved disclosure transparency and firm value; this contradicts findings reported by previous researchers.

There are at least two limitations to this research. First, due to pre-SOX data availability, our study was limited to activity starting in 1998. Future research should extend the pre-SOX time span in order to make more precise comparisons of pre- and post-SOX performance among foreign registrants. Second, this study was confined to examining the impacts of the SOX Act on foreign registrant performance in terms of board size, board independence, and disclosure transparency. Researchers may be interested in investigating the effects of SOX rules on corporate performance in terms of other corporate governance factors, including director expertise and the establishment of audit and other functional committees.

ENDNOTES

1. Section 301 of the Sarbanes-Oxley Act is an attempt to enforce the roles and responsibilities of directors and to promote greater director independence. Section 301 amends section 10A of the Securities Exchange Act of 1934 by requiring the SEC to have effective rules directing the national securities exchanges and national securities associations to prohibit listed companies.   In compliance with that amended section, the NYSE amended section 303A of corporate governance standards in its "Listed Company Manual," and the NASDAQ amended its NASD Rules 4200 and 4350. As a result, both NYSE and NASDAQ require that the majority of directors on the boards of all listed companies be independent. The revised rules also expand the roles and responsibilities of independent directors and independent board committees.

2. Foreign registrants are the foreign companies whose shares are cross-listed at both its local stock exchange and the US stock exchange. For instance, China Eastern Airlines Corporation Limited is listed at Stock Exchange of Hong Kong Limited, Shanghai Stock Exchange, and New York Stock Exchange, Inc..

3. In compliance with the US GAAP, any change in operating cash flows normally follows change in net income in the same direction.

4. Hostak et al. (2006) examined the impacts of SOX on voluntary delisting decisions by foreign firms from a corporate governance perspective. They used the same three variables as Leuz (2006) to evaluate financial disclosure quality: firm-level standard deviation of net income divided by standard deviation of operating cash flow (STDRATIO), firm-level median of absolute value of accruals divided by operating cash flow (MEDIANACC_OCF), and firm-level correlation between accruals and operating cash flow (CORR_NI_OCF). They predicted that companies with higher CORR_NI_OCF, lower STDRATIO, and lower MEDIANACC_OCF would have higher quality financial disclosure. According to their findings, foreign firms that voluntarily delist tend to have lower quality financial reports (e.g., significantly higher STDRATIO values) than non-delisting foreign firms.

5. The pre-SOX period consists of all years prior to SOX enactment (excluding 2002), and the post-SOX period is from 2003 to 2008. Due to data availability, in this study the pre-SOX period extends back to 1998.

6. Section 303A(1) requires that most50 NYSE listed companies have a board, a majority of whose members are independent directors.51 Section 303A further requires that the board of directors must affirmatively determine that a director has "no material relationship with the listed company (either directly or as a partner, shareholder or officer of an organization that has a relationship with the company)" for the director to be independent under the rule. the board is required to make a general determination that directors are independent, section 303A(2)(b) lists several relationships that would prevent a director from being independent: (i) A director who is an employee, or whose immediate family member is an executive officer, of the company is not independent until three years after the end of such employment relationship. (ii) A director who receives, or whose immediate family member receives, more than $100,000 per year in direct compensation from the listed company, other than director and committee fees and pension or other forms of deferred compensation for prior service (provided such compensation is not contingent in any way on continued service), is not independent until three years after he or she ceases to receive more than $100,000 per year in such compensation. (iii) A director who is affiliated with or employed by, or whose immediate family member is affiliated with or employed in a professional capacity by, a present or former internal or external auditor of the company is not "independent" until three years after the end of the affiliation or the employment or auditing relationship. (iv) A director who is employed, or whose immediate the affiliation or the employment or auditing relationship. (iv) A director who is employed, or whose immediate family member is employed, as an executive officer of another company where any of the listed company's present executives serve on that company's compensation committee is not "independent" until three years after the

end of such service or the employment relationship. (v) A director who is an executive officer or an employee, or whose immediate family member is an executive officer, of a company that makes payments to, or receives payments from, the listed company for property or services in an amount which, in any single fiscal year, exceeds the greater of $1 million, or 2% of such other company's consolidated gross revenues, is not "independent" until three years after falling below such threshold. (Johnson & Sides, 2004, p. 1160-1161).

7.   NASD Rule 4200(a)(15) defines "independent director" as "a person other than an officer or employee of the company or its subsidiaries or any other individual having a relationship which, in the opinion of the company's board of directors, would interfere with the exercise of independent judgment in carrying out the responsibilities of a director."100 NASD Rule 4200(a)(15) defines in detail who would *not* be considered independent: (a) a director who is, or at any time during the past three years was, employed by the company or by any parent or subsidiary of the company; (b) a director who accepted or who has a family member who accepted any payments from the company or any parent or subsidiary of the company in excess of $60,000 during the current or any of the past three fiscal years ….; (c) a director who is a family member of an individual who is, or at any time during the past three years was, employed by the company or by any parent or subsidiary of the company as an executive officer… ; (d) a director who is, or has a family member who is, a partner in, or a controlling shareholder or an executive officer of, any organization to which the company made, or from which the company received, payments for property or services in the current or any of the past three fiscal years that exceed 5% of the recipient's consolidated gross revenues for that year, or $200,000, whichever is more..; (e) a director of the listed company who is, or has a family member who is, employed as an executive officer of another entity where at any time during the past three years any of the executive officers of the listed company serve on the compensation committee of such other entity; or (f) a director who is, or has a family member who is, a current partner of the company's outside auditor, or was a partner or employee of the company's outside auditor who worked on the company's audit at any time during the past three years. (Johnson & Sides, 2004, p. 1169-1170).

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LESSONS FOR THE TARP WARRANTS FROM 1983 CHRYSLER AUCTION

Linus Wilson, University of Louisiana at Lafayette

ABSTRACT

The U.S. Treasury began auctioning its warrant holdings in December 2009. Nevertheless, this was not the first large auction of warrants. The U.S. Treasury auctioned its holdings of warrants from the bailout of Chrysler Motors in 1983. That warrant auction resulted in an implied volatility of less than zero, but it generated higher price than the management of Chrysler was willing to pay in negotiations. The similarities and differences between this auction and the more recent auction of the JPMorgan Chase warrants, which were issued as part of the Troubled Asset Relief Program (TARP), are discussed.

INTRODUCTION

Over twenty-six years ago the U.S. Treasury held an auction for an obscure financial instrument that has implications for whether taxpayers break even on their investments in the banking sector. The precedent set by this auction for the right to buy shares in Chrysler Motors in 1983 helped the U.S. Treasury collect over $4 billion in proceeds from its negotiations and auctions of bank warrants through the end of 2009. Warrants are call options issued by companies that increase the number of shares outstanding upon exercise. The holder of a warrant can purchase shares at a preset price prior to or on the contract's expiration date. By the end of 2009, according to (U.S. Treasury, 2009; Goldman, 2009), U.S. taxpayers have realized over $2.6 billion in losses from the failures of recipients of government-funded capital injections, since the capital was passed out beginning in October 2008. Thus the warrant proceeds have helped compensate taxpayers for the risks they continue to bear from their investments in the financial sector.

On September 12, 1983, Chrysler won the right to buy back the 14.4 million warrants that it issued to U.S. taxpayers for a price of $311 million. (That was about $675 million in 2009 dollars.) This auction was the largest warrant auction in U.S. history prior to December 10, 2009. On that day, the 88.4 million warrants of JPMorgan Chase were auctioned for approximately $950 million or $10.75 each, according to (Wilson, 2010). Those warrants were issued to the U.S. Treasury by the second largest bank holding company by assets because of its participation in the financial sector rescue known as the Troubled Asset Relief Program (TARP). The 1983 warrant auction presents some anomalous results. Nevertheless, the auction led to a higher price than managers at Chrysler were willing to pay in negotiations. By the end of 2009

the (U.S. Treasury, 2009) said that it owned warrants in over two hundred publicly traded banks, with various expiration dates in 2018 and 2019, as part of the Troubled Asset Relief Program. It will likely continue to auction its warrant holdings in the coming months and years. The publicly traded warrant market roughly doubled in December 2009, according to (Wilson, 2010), and it should multiply further in the subsequent months and years as these warrant auctions continue according to (Jones, 2009b).

THE 1983 AUCTION OF THE CHRYSLER WARRANTS

The 1983 auction is one of the few data points we have of large warrant auctions. The description here is drawn from the news accounts of (Lueck, 1983; Brooks, 1985; Eckblad, 2009) and the case study of (Bruner, 1986). In the summer of 1983, Chrysler was well on its way to retiring the taxpayers' loan guarantees that prevented an almost certain bankruptcy in 1979 or 1980. That summer Chrysler tried and failed to get Congress or the Treasury to forgive the warrants. After much public scorn in Congress for asking for the warrants to be forgiven, Chrysler under Lee Iacocca offered to repurchase the warrants from the U.S. Treasury for roughly their intrinsic value of $250 million, according to (Jones, 2009a). The intrinsic value of an option is its value if it had to be exercised today. Long-dated options are usually much more valuable than their intrinsic value. This extra value above their intrinsic value is often referred to as the time value of the option. On September 1, 1983, the U.S. Treasury set the deadline for bids on the warrants, which had a strike price of $13 and expired on December 31, 1990. The auction was a first-price, sealed-bid auction. Chrysler won the bidding at $311 million or $21.602 per warrant. The next closest bidder was a consortium led by Goldman Sachs and Prudential Bache Securities at $20.668 a warrant. There were only five total bids submitted. According to (Brown, 1983), all bids had to be for the entire lot of 14.4 million warrants.

I used the (Black & Scholes, 1973) model adjusted for dividends, which was developed by (Merton, 1973). In addition, I used the adjustments for dilution proposed by (Galai & Schneller, 1978). I assumed that warrant exercise would lead to percent ownership dilution of 12 percent. The closing price of Chrysler's stock on the day the bids were due was $28.375. The 7-year and 10-year T-notes were yielding 11.93 and 11.94 percent, respectively, on September 1, 1983. Chrysler was not paying a dividend at the time of the auction. The volatility in an option pricing model is the expected standard deviation of the stock price over the life of the option. I adjusted interest rates, dividends and volatility for continuous compounding.   Plugging in a volatility approaching zero, I obtained a price per warrant based on September 1, 1983, closing prices of $22.82. That is, the minimum possible Black-Scholes value of warrants was $1.22 more than the maximum bid at the auction! This also means that the implied volatility of the auction price was less than zero. Clearly, standard deviations cannot be less than zero. This price seems to present arbitrage opportunities. Nevertheless, my estimates of fair market value below show that these arbitrage opportunities are not large.

Perhaps investors were expecting Chrysler to pay some large dividends over the next seven years. They could have projected the dividends of the third largest U.S. automaker over the next seven-plus years by looking at the dividends paid by the 2nd largest U.S. automaker, Ford, over the previous six-or-so years. The average dividend yield of Ford Motor Company from January 2, 1977, to September 1, 1983, was 0.5 percent when annualized and adjusted for continuous compounding. (Yahoo! Finance, the source of the data, only has historic prices for Ford back to the start of 1977.) I obtained a warrant price of $21.73, which is still 13 cents above the price Chrysler paid when I used a dividend yield of 0.5 percent. Thus, dividend expectations alone cannot explain away the low implied volatilities.

An option is in the money if it can be exercised immediately at a profit. I think the low implied volatility anomaly stems from the fact that the Chrysler warrants were deeply in the money. Deeply in the money options are relatively insensitive to changes in volatility. Thus, a small discount from the Black-Scholes value for these warrants led to the anomalous implied volatilities. (Hull, 2002, p. 251) advises when projecting implied volatilities to only use options that are close to being at the money. At the money options have a strike or exercise price equal to the stock price. At the money options are also the most sensitive to changes in volatility expectations. In other words, the Chrysler warrants had a low sensitivity to volatility. An option's sensitivity to volatility is often referred to as its *vega*.

My estimates of fair market value of those warrants indicate that the Chrysler auction price was close to fair market value. Ford's historic volatility from the start of 1977 to the start of September 1983 was 30.8 percent. (Bruner, 1986) calculates the trailing 30-day historic volatility of Chrysler's stock price at 65.3 percent. Plus the implied volatility of a three month warrant with a strike price of $13 dollars and price of $16.38 traded on September 1, 2009, was a whopping 135 percent. It appears that there was little reason for the bidders to believe that Chrysler's stock volatility over the next seven years was zero! To estimate the fair market value of the Chrysler warrants, I plugged in a dividend yield and volatility of 31 and 0.5 percent, 65 and 0.25 percent, and 135 and 0 percent into my low, middle, and high estimates, respectively. Thus the Chrysler warrants should have been worth in total between $314, $343, and $397 million in each scenario. Per warrant values in the low, middle, and high scenarios were $21.79, $23.85, and $27.55. Thus, the auction generated between 99 and 78 percent of fair market value by my estimates.

COMPARISON WITH THE JPMORGAN CHASE WARRANT AUCTION

The JPMorgan Chase auction topped the Chrysler auction in terms of the real (or nominal) price paid. The former generated gross proceeds of $950 million versus $675 million (or $311 million) in the case of Chrysler. To estimate implied volatilities, you need option prices, stock prices, risk-free rates, times to expiration, and dividend yield projections. These parameters and estimates are summarized in table 1. According to the preliminary prospectus, the JPMorgan Chase auction was held on December 10, 2009, from 8:30 A.M. to 6:30 P.M. New York City

time. The close of trading on the New York Stock Exchange (NYSE) was 4:00 P.M. New York City time on that day. The author used the closing prices on the auction day, because those were the last regular trade prices.

The JPMorgan warrants were almost at-the-money because the strike price was $42.42 and the closing stock price was $41.27. Thus, investor's valuations of the JPMorgan Chase warrants were much more sensitive to volatility expectations of investors than was the case in the 1983 Chrysler warrant auction. The implied volatility of the JPMorgan Chase warrant auction was about 23.1 percent. This was about 800 basis points lower, or about 25.7 percent lower, than the 31.1 percent annualized implied volatility of an average of two-year options that expired in January 21. 2012, with strike prices between $40 and $45. 23.1 percent is also lower than the 10-year historic volatility from November 25, 2009, to November 24, 2009, of 49.8 percent or the GARCH(1,1) average projected volatility of 35.4 percent over the life of the warrant estimated in (Wilson, 2010). (GARCH is an acronym for generalized autoregressive conditional heteroskedasticity model. This popular method for estimating volatility based on historic stock returns was developed by (Bollerslev, 1986).) Since higher implied volatilities are associated with higher option premiums, investors at both the Chrysler and JPMorgan auctions were not willing to pay for nearly as much volatility as other historic and implied volatility metrics would suggest.

Table 1 LESSONS FOR THE TARP WARRANTS FROM 1983 CHRYSLER AUCTION Implied Volatility Calculations for the JP Morgan Warrant Auction and Two-Year Call Options on Dec. 10, 2009										
Option Contract	**Ticker**	**Option Price at Close**	**Strike Price**	**Expiration Date**	**Closing Price Date**	**Risk-Free Rate**	**Dividend Yield**	**Closing Stock Price**	**Time to Expiration in Years**	**Implied Volatility**
JP Morgan Chase Warrant Auction	JPM-WS	$10.75	$42.42	12/10/18	12/10/09	3.26%	1.83%	41.27	8.8877	23.07%
JP Morgan Chase's Jan. 2012 $45 Call Option	WJPAH	$8.05	$40.00	1/21/12	12/10/09	0.78%	0.48%	41.27	2.1151	31.55%
JP Morgan Chase's Jan. 2012 $40 Call Option	WHPAL	$5.93	$45.00	1/21/12	12/10/09	0.78%	0.48%	41.27	2.1151	30.71%

These are the inputs and implied volatility calculations used to estimate the annualized implied volatility of the long-dated call options and the warrant auction on December 10, 2009, based on closing prices on that day. For the warrant, the dividend yield is a simple average of both the continuously compounded ten-year average dividend yield and the current dividend yield. The historic dividend yield is defined as the average dividend divided by the average daily closing prices from November 25, 1999, to November 24, 2009. The current dividend yield is the most recent dividend divided by the stock price, which is then converted to annual compounding because dividends are paid quarterly. The risk-free rate for the warrant is a weighted average of the 7-year and 10-year U.S. Treasury rates adjusted for continuous compounding. The 7-year U.S. Treasury rate had a 1/3 weight and the 10-year rate had a 2/3 weight. For the options

expiring in 2012, the 2-year U.S. Treasury rate was adjusted for continuous compounding, and the dividend yield was the continuously compounded current dividend yield. The warrant price was taken from NASDAQ.com and the option prices were from MSN Money. Treasury rates were reported by the U.S. Treasury, and JPMorgan's (unadjusted) closing prices and dividends were taken from Yahoo! Finance. Warrant contract terms are from the preliminary prospectus. Option contract features are from MSN Money.

Like the Chrysler warrant sale where management rejected a lower price than the auction price, the JPMorgan warrant auction generated a higher price than was rejected in negotiations. According to (Dash, 2009), JPMorgan's offer in July 2009 was less than $900 million and the U.S. Treasury confirmed that the auction's net proceeds of $936 million was higher than JPMorgan Chase offered. Unlike the Chrysler auction, JPMorgan Chase confirmed in (Eichenbaum & Fineman, 2009) that it did not bid for its own warrants.

IMPORTANCE OF AUCTION DESIGN

(Bulow, Huang, & Klemperer, 1999) argue that bidders who have advantages over their rivals can significantly drive down the prices of common value auctions. The value of an object depends on its perceptions by other bidders in a so called "common value auction." In such situations, small differences in bidders' information can lead to significant differences in auction prices. Clearly, management at JPMorgan has better information than external bidders about the value of the TARP warrants, because they have more up-to-date and complete information about JPMorgan's prospects than can be found from public disclosures alone. A better informed bidder can scare away less informed bidders.

Bulow, Huang, and Klemperer, (1999) suggest handicapping the stronger bidder and advantaging other bidders. One handicapping mechanism would have bidders that are not the issuing bank to pay a price that is slightly less than the issuing bank and be able to win the auction. Alternatively, the issuing bank could be excluded from bidding on all or some of the warrants in the primary auction, but it would be free to buy the warrants in secondary market trades. (Bulow, Huang, & Klemperer, 1999) also suggest first-price, sealed-bid auctions. The sealed bids hide the aggressiveness or lack of aggressiveness of the better informed issuer, JPMorgan. Moreover, in this situation, the bidders with the most optimistic beliefs are more likely to pay for their optimism by offering a higher price for the warrants in a first-price versus a second price auction. Yet, the disadvantage of all these approaches is that they may seem "unfair" or that they discriminate against different bidders. Some bidders will pay higher prices than other bidders under these approaches; and thus, these alternatives may be politically unattractive even if they maximize taxpayer's revenues from such a sale.

The 1983 Chrysler warrant auction was a first-price, sealed-bid auction just as (Bulow, Huang, & Klemperer, 1999) recommend. Yet, I'm not sure that paper is entirely well suited for an item that is easily divisible in 88.4 million pieces. (Binmore & Klemperer, 2002) argue that

auction consultants are far cheaper than investment bankers, and that paper argues that good auction design can make a big difference in how much revenue an auction generates. The JPMorgan Chase, Capital One Financial, and TCF Financial warrant auctions in December 2009 were modified Dutch auctions with a minimum bid size of 100 warrants according to (Wilson, 2010). All investors paid the uniform price that sold all the warrants. The issuing company was allowed to bid on the same terms as other bidders, but in JPMorgan's case its managers chose to not bid at auction. In Capital One's case, they disclosed in a Securities and Exchanges Commission (SEC) form 8-K filing that they won no warrants at auction. Investors bidding above the auction price received all the warrants they requested. According to Hughes and (Eckblad, 2009; Thiruvengadam & Sidel, 2009), the bids had to be in $0.25 cent increments in both the JPMorgan Chase and Capital One Financial, which had eventual auction prices of $10.75 and $11.75, respectively. Thus, it is conceivable for small amounts of asymmetric information that the issuer could not over or underbid, less well informed investors, because of the $.25 bid increment in those two auctions. Yet, for asymmetric information that accounts for more than a couple of percent of the stock price, it seems likely that the bid increments may have protected less informed bidders from management's information advantage.

CONCLUSION

This note has looked at the U.S. Treasury's 1983 auction of its warrants issued by Chrysler Motors. That auction like the JPMorgan Chase auction that followed it 26 years later produced implied volatilities much lower than other traded options and historic volatility metrics. (The Black-Scholes-Merton implied volatility of the Chrysler auction was less than zero.) Both auctions employed very different auction designs. The Chrysler auction was a first-price, sealed-bid auction in which bidders had to submit bids for the entire lot of 14.4 million warrants. In contrast, the JPMorgan auction was a second-price, sealed bid auction in which bidders could submit bids for as little as 100 warrants. The Chrysler auction is the only large example of the effectiveness of a different auction design than the one used in the Troubled Asset Relief Program (TARP) warrant auctions in December 2009. The low implied volatility of the Chrysler auction indicates that it is an example of auction design that probably should not repeated. Nevertheless, both the Chrysler and JPMorgan auctions appeared to generate higher prices for the U.S. Treasury than could have been obtained by negotiations alone.

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STOCK SPLITS AND THEIR EFFECT ON SHARE PRICES: A STUDY OF FIRMS LISTED ON THE NAIROBI STOCK EXCHANGE (NSE).

Nelson Maina Waweru, York University
John Mwendwa, Strathmore University

ABSTRACT

The purpose of this research was to determine whether a stock split announcement had an impact on the related stock price with specific reference to companies listed at the Nairobi Stock Exchange. The specific objectives were to determine motivation behind stock splits within the Kenyan market; and to determine if stock splits have any effect on the share price. Primary and secondary data was used to achieve the research objectives. Primary data was obtained by conducting interviews with key decision makers in companies that had split their stocks and were listed at the Nairobi stock exchange. Secondary data was collected from the database of the Nairobi stock exchange.

The study established that most companies undertook stock splits so as to bring the trading range of the share price to an optimum point. This was undertaken so that the majority of investors, both individual and institutional, could have access to the shares of the company. The study further established that other factors such as the split ratio employed also influenced share prices. For example the fact that most companies at the Nairobi stock exchange employed a 10 for 1 ratio could have an effect on the post split share price.

BACKGROUND AND MOTIVATION

Lyroudi, Dasilas and Varnas (2006) argue that the relationship between stock splits and stock prices has been a subject of continuing interest to both economists and practitioners alike. They note that stock splits have long been a puzzling phenomenon to financial economists. This puzzle is usually associated with stock splits that elicit a positive stock price reaction upon the announcement. The reaction occurring after the announcement, however, has not been fully understood and explained.

According to Baker and Gallagher (1980), in theory, a stock split is merely an arithmetic exercise. They state that a stock split results in a reduction of the par value and a consequent increase in the number of shares proportionate to the split while all other capital accounts remain unchanged. They continue to state that theoretically, shareholders receive no tangible benefits from a stock split, while there are some costs associated with it. In practice however, corporate managers may view stock splits as more than an arithmetic exercise and may have other reasons

for issuing them. Dennis and Strickland (2003) argue that the effects of stock splits are puzzling. In theory a stock split is merely an accounting change, which leaves investors no better or worse off than they were before the split. They further state that this implies that there must be some benefit, either real or perceived, that results from a firm splitting its stock.

Greenberg and Brooker (1999) shed some light on the origin of stock splits saying that they began as a Wall Street gimmick to help individual investors avoid a penalty that brokers used to charge for "odd lot" purchases (fewer than 100 shares of a given stock). They argued that companies like it when retail investors buy their stock, because individuals are generally considered more loyal than institutions, but the higher a company's stock price rises, the fewer individuals there are who can afford to buy a 100-share block. They quote veteran market pundit Bob Stovall, of Stovall/Twenty First Advisers who said that American management discovered long ago that the individual investor likes to buy stocks that trade at $40 per share, hence the urge to split.

Guo et al. (2005) discuss about the trading range hypothesis which suggests that stock splits bring share price to a preferred price range. Managers often justify stock splits on the basis that they improve liquidity and marketability. Guo et al quote Ikenberry et al. (1996) who conducted empirical research and had inconclusive results based on splits leading to improved liquidity and marketability. The optimal trading range may arise for other reasons such as a desire by firms to control the relative tick size at which their shares trade, a desire by managers to increase ownership by individual investors, and a desire by the brokerage firms to preserve commission income.

Different authors; Guo et al. (2005), Fama et al; Lakanishok and Lev (1987) and Harper (2000) support the reasons stated with others adding a number of reasons for the stock splits. One argument is that individual shareholders tend to be wealth constrained and, therefore, they cannot afford to acquire a round lot of a firm's stock if the price is too high. By splitting their stock, firms make their stock more attractive for the individual investor (Lakonishok and Lev (1987), Conroy and Harris (1999), Schultz (2000)). With the lower post-split price, it is observed that there is a lower proportion of institutional ownership, and a higher proportion of individual ownership, after the split than before the split. There is also the argument that is based on trading costs. Several studies (Conroy, Harris and Benet (1990), Gray, Smith and Whaley (1999) show that the percentage bid/offer spread increases following a split. The fact that institutions trade more frequently than individuals, and that the bid/offer spread is the primary component of their trading cost, implies that institutions should dislike splits unless some other benefit exists. Following a split, it is expected that the proportion of institutional ownership of a stock decreases, as institutions flock to equivalent stocks with lower relative bid/offer spreads.

Most of the arguments discussed are why companies split their stocks. However, the Carlson (2007) gives some reasons as to why some companies opt not to split their stocks. Some of the reasons are:

- A high stock price means a high-quality Company: This implies that investors give a certain cachet and prestige to high-priced stocks. Thus, many companies are willing to sport triple-digit stock prices.
- The fear of a market correction: Companies may be reluctant to split their stock because they believe the stock market may be due for a significant market correction, one that could drop their post-split stock prices to uncomfortably low levels.
- Individual investors do not really matter: Institutional investors and hedge funds drive the markets these days, and these investors, unlike individual investors, don't have any problem buying lots of shares of high priced stocks. To them, the absolute stock price is irrelevant.

The evidence suggests that the main motive for stock splits is moving the stock price into a better trading range, followed by improving trading liquidity. As has already been stated stock splits are simply numerical changes that provide no tangible gains or losses to the investors or the companies that are undertaking the stock splits. However, empirical evidence reported by Masse, Hanrahan and Kushner (1997) and Arbel and Swanson (1993) show that there are economic gains achieved by the stock splits announcement and consequent implementation.

Theories discussed in the subsequent chapter such as EMH (efficient market hypothesis) provide a contrasting view. For Example the EMH(efficient market hypothesis) states that one cannot outperform the market and in one way or another it counters the signaling theory. On the other hand the the alternative liquidity and trading range hypothesis claims that the motivation for split activities is to bring stock prices down to a preferred trading range and improve liquidity. However, existing empirical research, finds that the impact of split on liquidity is mixed Copeland (1979), Conroy and Harris (1999), and Desai et al (1998), find that bid-ask spreads, increase thus indicating worsened liquidity.

If stock splits of common shares are nothing more than a cosmetic change and have no impact on the value of the firm, then why do many companies split their stocks every year? This implies that there must be some benefit, either real or perceived, that results from a firm splitting its stock. This study therefore sought to determine if the splitting of stocks has any value adding associated with it in an emerging economy. The study focused on the Kenyan market, specifically the Nairobi Stock Exchange. The study was aimed at addressing the following objectives:

- To determine the reasons Kenyan firms undertake stock splits within the Kenyan market
- To determine if stock splits have any effect on the share price

The remainder of this paper is organized as follows: Section two presents a review of the existing literature. Next, the research methodology adopted is outlined in section three. Section four presents the research results, followed by a discussion of the findings and conclusion in the final section

LITERATURE REVIEW

Motivation of Stock Splits

Many hypotheses may explain the persistence of splits and their associated effects. Explanations for stock splits can be classified broadly into three groups:-trading range, signaling, and liquidity hypotheses.

The Signaling Theory

According to Naidu (2008), signaling theory was proposed by Brennan and Copeland in 1988. The theory assumed that managers have private information about the future prospects of their own firm. If a firm with good prospects splits its stock, then its percent spread (bid-ask) will increase temporarily. Eventually, the market will come to perceive the same good information that the managers knew, causing the firm's price to rise and the percent spread to return to an even range. However, Grinblatt, Masulis and Titman, in their 1984 document, come up with the concept but do not formally call it the signaling theory (Mc Nichols and Dravid,(1990).

Naidu (2008), further states that if a company with average or bad fundamentals splits, then its percent spread will increase permanently. This cost differential allows good firms to signal by splitting and prevents average or bad firms from emulating others. The signaling theory predicts that splitting firms should receive positive returns on the announcement of a split. The empirical evidence finds a positive abnormal return on a split announcement. An empirical challenge for signaling is that there is no evidence that split firms actually experience a temporary increase in percent effective spread as compared to non-split firms.

Brennan and Hughes (1991), developed a model that showed higher commissions on stocks with lower prices serve as the cost for issuing the split. These higher commissions also provide the incentive for full service brokers to follow firms more closely that have their prices in an optimal trading range. Therefore, by issuing a split and lowering its stock price into a higher commission range, a firm makes its stock more attractive to full service brokers and draws the attention necessary to reveal favorable private information.

Klein and Peterson (1989) find that companies announcing splits experience greater earnings forecast revisions than similar non-splitting matched controlled companies. The difference in forecast revisions between split and control companies are significantly positively related to abnormal returns at the split announcement. These results, consistent with those found by Lakonishok et al., as reported by Baker and Powel(1993), suggest that split announcements convey information about future earnings and that this information may cause abnormal returns at the announcement. Baker and Powel (1993) report on Grinblatt et al.(1984) who also support the notion of informational signaling of stock distributions.

The Trading Range Hypothesis

Naidu (2008) further gives the origin of the trading range hypothesis. He notes that the originator of this was Copeland in his 1979 work. The idea is that a split lowers the price, which makes trading more affordable. This leads to an increase in the base of traders in the firm. In turn, this eventually increases the volume of trade, which eventually lowers the percent spread. The empirical evidence finds that split firms experience an increase in the base of traders and an increase in volume.

Naidu (2008) further adds that splits keep stock prices within an optimal trading range, making it easier for small investors to buy round lots, that result in an increase in the number of shareholders. An empirical challenge for the trading range hypothesis is that there is no evidence that split firms eventually experience a lower percent spread. In other words, there is no evidence that splitting firms receive the predicted long-run liquidity improvement from splitting.

Baker and Powell (1993) give another suggestion as to why stock splits occur. They state that stock splits restore stock prices to some preferred trading range. This presumes that shareholders prefer to purchase round lots but cannot afford to do so when the share price is high. Opponents argue that fees for odd lots are small and institutional investors, who purchase more stock than individuals, are indifferent to price levels, provided the expected returns are commensurate with the risk.

Researchers have examined hypotheses about stock splits using two divergent but complementary approaches--surveying managers and using market data. Few researchers have surveyed managers to get their views about stock splits. Most have used stock market data to make inferences about managerial motives and to explain real effects of stock splits. For example, Baker and Powell (1993) find that firms with an unusual growth in earnings and stock prices issue stock splits. They infer that the main objective of the split is to return the stock price to a normal range after an unusual growth period. The normal range is based on market and industry-wide price averages and possibly on some firm-specific prices. Their results partially support the signaling motive, but not the liquidity motive.

The Liquidity Hypothesis

According to Dennis (2003) the origins of this hypothesis can be traced to the early studies of Muscarella and Vetsuypens (1996) and Schultz (2000) that found that volume, especially small-sized trades, increase following a split, while other studies, such as Lakonishok and Lev (1987) found that volume decreases following a split. Dennis (2003) argues that a problem may arise in the interpretation of such changes particularly in the post-split liquidity. Post-split liquidity could be driven by the lower share price, which enables more investors to purchase the stock. However, post-split liquidity could also be driven by signaling. Specifically, the public may

interpret a share split as a signal of good news by the management of firms and subsequently increase their trading of the stock.

Baker and Powell (1993) give a third explanation for stock splits and this focuses on managements' desire to use splits to improve trading liquidity. Proponents of this view suggest that splitting firms can make shares more attractive to investors by lowering the stock price. By attracting attention, stock splits may affect both the number of trades and the number of stockholders. Increases in these two variables may serve to increase a stock's post-split liquidity. For example, if splits enable more individual investors to buy shares in round lots, the number of trades may increase, but the average size of the trades may decline. Empirical research is inconsistent on the effect of stock splits on trading liquidity.

There is an apparent inconsistency between managements' expressed belief that splits improve shareholder liquidity and empirical evidence that splits result in decreased liquidity. Several studies reporting a reduction in liquidity use trading volume and percentage bid-ask spreads as liquidity measures. Yet managers often do not view liquidity in these terms. Instead, they perceive liquidity in terms of increasing the number of shareholders and widening the ownership base. Empirical evidence supports the notion that stock splits result in an increase in these liquidity-related factors affecting liquidity. Hence, the findings lend some credence to managements' view that splits increase liquidity.

Glanz (2000) gives the example of MicroStrategy. He states that as revenue has grown, MicroStrategy's stock price has ballooned, putting it out of reach of some individual investors, analysts say, and that's the company's motivation for splitting its stock. But Glanz (2000) essentially puts its that the reason why they split the stock is to ensure that the stock is within range of the average investor to boost the number of trades on that stock that take place. This essentially makes the stock more liquid because more trades do in the eventuality boost the stock price.

The Managerial Entrenchment Hypothesis

This hypothesis is based on agency costs and managers opportunistic behavior. Menendez and Gomez-Anson (2003) quote Mukherji et al., who proposed a new hypothesis with regards to stock splits. Mukherji state that managers use stock splits to alter the firm's ownership structure by increasing the number of individual investors and reducing the stake of the institutional shareholders. Menendez et al., also cite Lakonishok and Lev (1987) who give further insight to this hypothesis stating that organizations seek to increase the individual investors to deter any possibilities of takeovers from institutional investors who hold great percentage of shares. The proponents of this hypothesis state that one major result of stock splits based on this hypothesis is that the number of individual investors would increase and the institutional investors decrease.

The hypotheses so far proposed seem to be interrelated and drawing fine lines separating the individual hypotheses becomes difficult. The management entrenchment hypothesis seems to

be closely related to the trading range hypothesis as well as signaling theory which all seem to emanate from a management perspective with their best interests at heart. A major result of the trading range hypothesis is that a new class of investors is attracted who are mainly individual investors (Mark, 1995).

Essentially one can propose that by management attempting to bring the share price within optimal range, they are indeed signaling to would-be potential investors of future gains of the company. The sheer volume of these individual investors "signaled to" would result in them buying numerous shares and subsequently diluting the hold of the institutional investors.

Effect of Stock Split on Share Price

Dennis and Strickland (2003) argue that the effects of stock splits are puzzling. In theory a stock split is merely an accounting change, which leaves investors no better or worse off than they were before the split. Yet stock splits are relatively common occurrences. They further state that this implies that there must be some benefit, either real or perceived, that results from a firm splitting its stock.

Masse, Hanrahan and Kushner (1997) in report on a Canadian study undertaken by Charles investigating returns to stock splits, who found that that split stocks outperform the market by 59 percent in the 49 months prior to the announcement, match the market in the first year after the announcement, and under perform by 7 percent in the second year after the announcement. Masse et al.,(1997) cite Kryzanowski and Zhang, who using daily data, found that there was a statistically positive abnormal return on the announcement date and a positive but not statistically significant return on the approval date. In their own study Masse et al.,(1997) use event date methodology to examine the market reaction to regular stock splits, reverse splits, and stock dividends. For regular stock splits they found that the market reacts positively with a cumulative abnormal return of 4.3 percent on the first trading day following the announcement. They also found that the market anticipates the stock split but underestimates the increase.

A study reported by Arbel and Swanson (1993) found that stocks listed on the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) react positively to stock split announcements that are not contaminated by other contemporaneous firm-specific news. Their analysis supported both the trading range and attention hypotheses.

There are other theories that come into play when focusing on share price and the market in general – the arena in which stock splits take place. The most common of these is Efficient Market Hypothesis which will be discussed here in. Relatively newer theories such as Adaptive Market Hypothesis and Incomplete Revelation Hypothesis are discussed in the subsequent section.

The Efficient Market Hypothesis Theory (EMH)

According to the EMH, the stocks always trade at their fair value on stock exchanges, making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices. As such, it should be impossible to outperform the overall market through expert stock selection or market timing, and that the only way an investor can possibly obtain higher returns is by purchasing riskier investments.

Back in the early 1960s, EMH was developed as an academic concept by Professor Eugene Fama at the University of Chicago Graduate School Of Business. The theory has certain attractions. It suggests all stock market analysis and investment decisions can be reduced to mathematical formulae and it fits in with the current belief in the all-powerful efficiency of free markets (The Birmingham Post, 2007).

The academic community is showing increasing dissatisfaction with the EMH (Efficient Market Hypothesis), swayed partly by evidence that prices under react to large earnings changes, ratios of prices to fundamentals, and other statistics derived from fundamental accounting analyses. However, the EMH still influential because there is no alternative theory that explains why we observe the inefficiencies we do. For example, why should the market under-react to large earnings changes, rather than overreact? Without a theory predicting how and why markets are inefficient, studies showing mispricing can be viewed as statistical flukes resulting from fishing expeditions (Fama 1998; Kothari 2001).

Efficient Market Hypothesis can be contradicted on a number of accounts. Opponents state that the efficient market hypothesis assumes that all investors perceive all available information in precisely the same manner. The numerous methods for analyzing and valuing stocks pose some problems for the validity of the Efficient Market Hypothesis. Since investors' value stocks differently, it is impossible to ascertain what a stock should be worth under an efficient market. Secondly, under the efficient market hypothesis, no single investor is ever able to attain greater profitability than another with the same amount of invested funds: their equal possession of information means they can only achieve identical returns. Thirdly, under the efficient market hypothesis, no investor should ever be able to beat the market, or the average annual returns that all investors and funds are able to achieve using their best efforts. There are, however, many examples of investors who have consistently beat the market - you need look no further than Warren Buffett to find an example of someone who's managed to beat the averages year after year.

Although it is relatively easy to pour cold water on the efficient market hypothesis, its relevance may actually be growing. With the rise of computerized systems to analyze stock investments, trades and corporations, investments are becoming increasingly automated on the basis of strict mathematical or fundamental analytical methods. Given the right power and speed, some computers can immediately process any and all available information, and even translate such analysis into an immediate trade execution.

Van Bergen (2009) concludes that it is safe to say the market is not going to achieve perfect efficiency anytime soon. He notes that for greater efficiency to occur, the following criteria must be met: (1) universal access to high-speed and advanced systems of pricing analysis, (2) a universally accepted analysis system of pricing stocks, (3) an absolute absence of human emotion in investment decision-making, (4) the willingness of all investors to accept that their returns or losses will be exactly identical to all other market participants.

The Adaptive Market Hypothesis (AMH)

The Adaptive Market Hypothesis was proposed by Andrew Lo in 2004. The hypothesis reconciles theories that imply that the markets are efficient with behavioral alternatives, by applying the principles of evolution - competition, adaptation, and natural selection - to financial interactions. Specifically, the Adaptive Markets Hypothesis can be viewed as a new version of the Efficient Market Hypothesis, derived from evolutionary principles. Prices reflect as much information as dictated by the combination of environmental conditions and the number and nature of "species" in the economy. Species refers to the distinct groups of market participants, each behaving in a common manner. For example, pension funds may be considered one species; retail investors another; market makers a third; and hedge fund managers a fourth. If multiple species (or the members of a single highly populous species) are competing for rather scarce resources within a single market, that market is likely to be highly efficient, Market efficiency cannot be evaluated in a vacuum, but is highly context dependent and dynamic, just as insect populations advance and decline as a function of the seasons, the number of predators and prey they face, and their abilities to adapt to an ever-changing environment.

Lo (2004) states that the profit opportunities in any given market are akin to the amount of food and water in a particular local ecology—the more resources present, the less fierce the competition. As competition increases, either because of dwindling food supplies or an increase in the animal population, resources are depleted, which in turn causes a population decline, eventually reducing the level of competition and starting the cycle again. In some cases cycles converge to corner solutions; i.e., certain species become extinct, food sources are permanently exhausted or environmental conditions shift dramatically. By viewing economic profits as the ultimate food source on which market participants depend for their survival, the dynamics of market interactions and financial innovation can be readily derived. Lo (2004) further states that under the AMH, (Adaptive Market Hypothesis) behavioral biases abound. The origins of such biases are heuristics that are adapted to non-financial contexts, and their impact is determined by the size of the population with such biases versus the size of competing populations with more effective heuristics.

The Adaptive Market Hypothesis has several implications that differentiate it from the Efficient Market Hypothesis such as: To the extent that a relation between risk and reward exists, it is unlikely to be stable over time; Contrary to the classical Efficient Market Hypothesis,

arbitrage opportunities do exist from time to time; Investment strategies will also wax and wane, performing well in certain environments and performing poorly in other environments. This includes quantitatively, fundamentally and technically-based methods; Survival is the only objective that matters while profit and utility maximization are secondary relevant aspects; and innovation is the key to survival because as risk/reward relation varies through time, the better way of achieving a consistent level of expected returns is to adapt to changing market conditions.

Therefore, under the Adaptive Market Hypothesis, investment strategies undergo cycles of profitability and loss in response to changing business conditions, the number of competitors entering and exiting the industry, and the type and magnitude of profit opportunities available. As opportunities shift, so too will the affected populations. However, AMH(adaptive market Hypothesis) is still under development, and certainly requires much more research to render it "operationally meaningful" , Andrew, Lo (2004).

The Kenyan Stock Market

In Kenya, calls for share splits reached a crescendo at the height of the stock boom in the year 2004 that when stock prices rose by 100% as reported in the end of year NSE market publication. Among the leading lights pushing for the adoption of the concept in the Kenyan market was the current NSE chairman Mr. Jimnah Mbaru (NSE, 2008). His argument then was stock splits would allow more investors to enter the market in the midst of price exuberance. The concept was approved by the Capital Market Authority in June 2004 and entrenched in the NSE listing manual.

Musau (2009) states that in Kenya, the NSE is characterized by retail investors who mainly focus on capital gains and not income/dividend investing. Therefore, majority will look at their investment time-frame as ranging from a few weeks to say six months. This translates to small capital outlays.

Companies such as Kenol-Kobil, East African Cables, East African Breweries, ICDCI and Barclays Bank, with highly priced shares opted to split their shares to make them affordable to the public and benefit the company as well as potential investors. However, the extent to which this serves its goal is yet to be seen. Another company that also split its shares despite the fact that the price was not too high was Sasini Tea and Coffee (now Sasini Ltd). All counters other than Sasini Ltd were trading at over Ksh.200 prior to the announcement of the split. Sasini was at a high of Ksh. 185 prior to the announcement. Reverse stock splits have not been witnessed in the country as the market is still at infancy and the demand driven by few listing has only caused appreciations other than declines in very stable companies.

From a local point of view Musau argues why there may be price appreciation after a split. He says that after the split, the share price is likely to start low and after sometime, appreciate tremendously for a short time. The sudden rise does not occur by chance. He argues that once a split has been approved by the Capital Markets Authority (CMA), it takes the Central Depository

and Settlement Corporation (CDSC) time to credit the split shares into the client's accounts. Prior to updating of the client's accounts with the shares, only the principal number of shares trade steering an artificial supply hitch. Once the crediting is finalized, the split shares flood the market creating excess demand.

The Nairobi Stock Exchange

In 1954, The Nairobi Stock Exchange was constituted as a voluntary association of stockbrokers registered under the Societies Act. Since Africans and Asians were not permitted to trade in securities until after the attainment of independence in 1963, the business of dealing in shares was then confined to the resident European community. At the dawn of independence, stock market activity slumped due to uncertainty about the future of independent Kenya. The first three years of independence, were marked by steady economic growth, rekindling confidence in the market. The exchange also handled a number of highly oversubscribed public issues.

In the year 2000, there was a notable achievement that thrusted the stock exchange to the next level. The Central Depository System (CDS) Act and the amended CMA Act (which covered Collective Investment Schemes (CIS)) were passed by Parliament and received presidential assent, paving the way for the full implementation of the CDS and for the introduction of collective investment schemes in the Kenyan market.

The Structure of the Stock Market

As at December 2009, there were 59 listed companies (55 equities, 7 corporate bonds 3 of which have listed equities). There are over 60 Government of Kenya treasury bonds listed on the fixed income segment of the securities exchange. The market regulator is the Capital Markets Authority of Kenya CMA (K). The Authority is a government body mooted in 1989, under the Ministry of Finance and through the Capital Markets Authority Act Cap 485A (the CMA Act). The Authority was established to regulate and oversee the orderly development of Kenya's capital markets. The instruments traded are equities, preference shares, treasury bonds and corporate bonds. There are 2 indices used: NSE All Share Index (NASI) and NSE 20-Share Index. NASI is market capitalization weighted, while NSE 20 Share Index is geometric Mean of 20 Companies share prices. Delivery and settlement of shares is done via the Central Depository and Settlement Corporation (CDSC). NSE has the following Three market Segments:

1.   Main Investments Market Segment (MIMS)
2.   Alternative Investments Market Segment (AIMS)
3.   Fixed Income Securities Market Segment (FISMS)

The main difference between the market segments is the capitalization of the companies. Companies within the MIMS segment must have a minimum authorized, issued and fully paid up share capital of Kshs 50 million and net assets of Kshs 100 million before the public offering of shares. Companies in the AIMS segment must have a minimum authorized, issued and fully paid up shares of Kshs 20 million and net assets of Kshs 20 million before seeking listing. Companies in the FISMS segment must have a minimum authorized, issued and fully paid up share capital of Kshs 50 million and net assets of Kshs 100 million before the public offering of the securities. In the event that the issuer does not have net assets of Kshs 100 million, the issuer must obtain from a bank or any other approved institution a financial Guarantee to support the issue.

The Legal structure in Kenya on stock splits

It is worth noting that according to the CMA (Capital Markets Authority) Act of June 2004, stock splits are allowed only in the 'forward' way, which means reverse splits which allow for consolidation of shares is not legal. This is the reason why the opposite of forward splits has not been allowed in the Nairobi stock Exchange. Reasons given in the Nairobi Stock exchange Newsletter of August 2004 state that the Kenyan Market is still a 'thin' market that can not yet handle the effects of a reverse split. Legal developments hence will provide a key research area.

RESEARCH METHOD

The study adopted a descriptive research design where data concerning stock splits and their effects on stock prices was collected. Kombo and Tromp (2006) states that the major purpose of a descriptive research is to describe the state of affairs as it exist. It is also used to identify why something is happening. The methods involved range from the survey which describes the status quo, the correlation study which investigates the relationship between variables, to developmental studies which seek to determine changes over time. A descriptive design was therefore preferred because the study sought to determine the relationship between stock splits and share prices, if the former does indeed affect the latter.

A census was conducted for the companies that had undertaken the stock split because the population size was quite small. As a result the period under study was thus between 2004-2009 because this was when stock splits had taken place in the Nairobi Stock Exchange, stock splits having been legally allowed in June 2004. All the companies that had undertaken the stock split in the Nairobi Stock Exchange were be used, 10 in total.

With regards the first objective, personal interviews were used to obtain data relevant to this objective. Personal interviews were used to solicit direct responses especially from relevant managers or high ranking employees of the companies who were present when the companies undertook their respective stock splits. As regards the second specific objective, documentary secondary sources of data were used to provide a great deal of the required information. Such

sources included journals, relevant text on stock splits, company data, NSE trading data as well as previous studies.

RESULTS AND FINDINGS

Interview Responses

The institutions were categorized by market segment to which they belonged depending on their operations as grouped in the NSE. These categories were: agricultural sector; commercial and services sector; finance and investment sector; and industrial and allied sector. Table 2 shows the market segment sectors to which the different respondent institutions in the study belong.

Table 2: Market Segment Representation		
Market Segment Sector	Frequency	Percentage
Agricultural	1	17
Commercial and Services	1	17
Finance and Investment	2	33
Industrial and allied	2	33
Total	6	100

Motivation of the Stock Splits

Respondent companies were asked what their major motivation behind the stock splits was. Five respondents stated that their share prices had risen far beyond the range in which they wished their shares to trade at and hence split them to bring them back to a preferred optimal range. One respondent stated that the reason for the splits was to "give off" positive information to potential and current investors that the company was indeed doing well.

Table 3: Motivation of Stock Splits		
Respondent Motivation of Stock Splits:	Frequency	Percentage
Optimal Trading Range of Share Price	5	83
Signal Positive Information	1	17
Total	6	100

At Kenol-kobil for instance, the Chief Finance Officer was candid that splitting their stock enable it to become affordable to vast majority of retail investors. This was so especially due to the rocket high share price that the company's share was trading at the Nairobi stock exchange. On other motives for splitting the stock, Kenol-Kobil also wanted to signal the market that it was in deed a well performing company and thus was the pioneer in splitting stocks in Kenya. This was however not to a significant level as they key reason was bringing the share price to an acceptable trading range.

Barclays Bank, Sasini Ltd, CMC Ltd and Nation Media group provided similar results form the interviews with top management persons interviewed indicating that at the time of the splits the share prices were trading at abnormally high prices hence locking out potential retail investors from the firms' stocks. Managers at Barclays and Kenya Commercial bank decried the tedious process enforced by the regulator (Capital Markets Authority) on the split process and the need to make it flexible to enable more firms spilt their stocks. The legal framework was also said to be rigid in that it only enables forward splits and that it had not been reviewed since 2004. This was identified as a key policy area that needs review.

Steps involved in undertaking a Stock Split

Those interviewed seemed to have similar steps whilst undertaking the stocks split. The initial decision to undertake the split was agreed upon by the Board of directors with the information being passed on to the share holders. A request is then put in to the Capital Markets Authority which has to approve the same. Once the request is approved the directive is then passed on to the Central Depository and Settlement Corporation (CDSC) to credit the CDS accounts of the share holders.

The Impact of Share Split on Capitalization, Share Value and Company Ownership

Respondents were asked the impact the stock split had on market capitalization of the company as well as share value and company ownership.

Table 4: Impact on Capitalization		
Respondent Impact on Capitalization:	Frequency	Percentage
Positive Impact	4	67
No change	1	16
Negative Impact	1	17
Total	6	100

Sixty-seven percent (67%) of the respondents said that the stock split had a positive impact on the capitalization of the company, with 17% saying it had a negative impact. 16% of the respondents stated that it had no impact whatsoever on market capitalization.

Table 5: Impact on Share Value		
Respondent Impact on Share Value:	Frequency	Percentage
Positive Impact	5	83
No change	1	17
Negative Impact	0	0
Total	6	100

Eighty-three percent (83%) of the respondents stated that the stock split did have a positive impact on the share price after the split. 17%, who was one respondent, stated that there was no change in share value after the split.

Table 6: Impact on Composition of Ownership		
Respondent Impact on Composition of Ownership:	Frequency	Percentage
Positive Impact	6	100
No change	0	0
Negative Impact	0	0
Total	6	100

All the respondents stated that there was positive impact on the composition of the ownership structure, with more "small" investors acquiring the said stock. There was a greater variety of owners (institutional investors, medium and small investors) after the split.

The Decision on Splitting a Stock

The respondents were asked whether in their opinion splitting the stock was a good decision.

Table 7: Decision on Splitting Stock		
Respondent Decision on Splitting Stock:	Frequency	Percentage
Good Decision	5	83
Bad Decision	1	17
Total	6	100

Five of the six respondents (83%) stated that splitting their stock was a good decision as it generally increased the share value after the split and that lower income investors were able to purchase their stock hence impacting on the ownership of the company. 1 respondent (17%) stated that splitting the stock wasn't a good decision because the post-split value of the share was still the same, terming it a mere arithmetic change.

Effects of Stock splits on share price

Table 8 below shows a list of the ten companies that split their stock between 2004 and 2009. The share prices were calculated on the basis of a 20 day average before and after the split.

Table 8; Stock splits issued					
Company	Date of Split	Share prices before split Kshs	Share prices after split Kshs	Percentage change %	Split Ratio
BBK	Nov 2006	585	91	83	5:1
Centrum	Jan 2007	535	55	89	10:1
CMC	Feb 2007	280	25	91	10:1
EABL	Nov 2007	540	175	67	10:1
EAC	Sept 2006	600	50	91	10:1
Equity	March 2009	160	25	84	10:1
KCB	Feb 2007	255	27	89	10:1
Kenol	Sept 2004	420	125	70	20:1
NMG	July 2008	320	75	77	2:1
Sasini	Feb 2007	150	12	92	5:1

According to the results 6 companies (60%) used a split ratio of 10:1. The share prices decreased significantly after the split (an average decrease of over 80%), which is consistent with the liquidity theory which stipulates that companies tend to split their stocks so us to lower the share prices and increase trading volumes.

DISCUSSION AND CONCLUSIONS

The general objective of this study is to determine whether a stock split announcement has an impact on the related stock price with specific reference to the Kenyan market. The study period was from 2004-2009 targeting the listed companies that had undertaken stock splits. The specific objectives were to:

- Determine the reasons Kenyan firms undertake stock splits within the Kenyan market
- Determine if stock splits have any effect on share price

The study used descriptive and an element of exploratory research design and more specifically employed the survey method. This was considered to be an ideal research design for the study as it had a qualitative approach to data collection and analysis. Personal interviews were used to collect primary data. Relevant secondary data was also used and all the data was analyzed and presented in the form of tables, charts, graphs and descriptive narrative. The first major finding was that most companies undertook stock splits so as to bring the trading range of the share price to an optimum point. This was undertaken so that majority of investors, both individual and institutional, could have access to the stock. If the stocks were left at the lofty prices they were attaining then it would lock out a great number of individual investors as such prices would only favor the institutional investors.

The second major finding is that there must be other factors at play that determine the share price after a stock split. This was drawn from the inconclusive results obtain from the secondary data in terms of the share price for up to a period of two years, save for the stocks which haven't attained such a time frame after their split.

Discussion

The Motivation behind Stock Splits

The research findings revealed that the major reason why companies do undertake stock splits is to bring the price to an optimum trading range. This is in line with the work put forth by Copeland in 1979 (Naidu, 2008) whose idea was that a split lowers the price, which makes trading more affordable. This leads to an increase in the base of traders in the firm. In turn, this eventually increases the volume of trade. Mack (1995) says stock splits occur when the board feels that the share is overvalued and the company is missing out on the numerous mid-level investors. Baker and Powell (1993) give another suggestion as to why stock splits occur. They state that stock splits restore stock prices to some preferred trading range Arbel and Swanson (1993) find that splits are aimed primarily at restoring stock prices to a normal trading range. This study follows the above mentioned studies with the findings that splitting stocks keeps the price in an optimal trading range making it easier for small investors to 'own' part of the company. In essence, such firms don't want to be associated only with the upper and middle classes but also want the common man to feel that they are part and parcel of the ownership of such an organization.

Another finding was companies also split prices in order to give off a positive outlook that the company is doing well, and that future prospects were bright and positive. This is in line with the signaling hypothesis which was proposed by Brennan and Copeland in 1988 (Naidu, 2008). Considering that there is information asymmetry between the management of the company and the investors, stock splits act as informative signals of favorable information from the managers to the investors. Other studies that have similar findings include those of Baker and Powell (1993) who state that a major explanation to stock splits is the signaling or information asymmetry hypothesis which states that stock splits are informative signals of favorable future prospects for the firm. Brennan and Copeland (1988) show that stock splits serve as costly signals of managers' private information because stock trading costs depend on stock prices. Additionally, Klein and Peterson (1989) find that companies announcing splits experience greater earnings forecast revisions than similar non-splitting matched controlled companies.

Essentially the two theories supporting the reasons for stock splits are somewhat related. For example, the optimal trading range may be desirable because it is associated with higher commissions and trading costs. This makes the stock more desirable for full service brokers and draws attention to the stock. Lowering the share price attracts investors, especially individual

investors, and therefore increases the ownership base. Additionally, shifting the composition of shareholders toward a greater proportion of individuals could lessen the chance of an unfriendly takeover.

Effect of Stock Splits on Share Price

The secondary data obtained by the study indicate that the post-split price of the stocks decreased significantly after the split. Such results are fairly consistent with the findings of Arbel and Swanson (1993) who found that stocks listed on the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) react positively to stock split announcements that are not contaminated by other contemporaneous firm-specific news.

Essentially, these findings are in line with both the definitions of stock splits given, i.e. accounting changes that should provide no tangible gains or losses to the investors or the companies that are undertaking the stock splits and theories such as EMH which state that one cannot outperform the market. Furthermore the results are in line with AMH (Adaptive Market Hypothesis) theory which supports stock splits affecting share prices because of its link to the investors' behavior, such that one would invest only in what would benefit him/her i.e. the increased competition for greater profits to ensure survival. This competition would be presented via stock splits and information accompanying the same. Lo (2004) states that the profit opportunities in any given market are akin to the amount of food and water in a particular local ecology—the more resources present, the less fierce the competition. Therefore, under the AMH (Adaptive Market Hypothesis) , investment strategies undergo cycles of profitability and loss in response to changing business conditions, the number of competitors entering and exiting the industry, and the type and magnitude of profit opportunities available. As opportunities shift, so too will the affected populations. Such results are consistent with this research's findings.

Conclusion

From the research findings it was deduced that the major reasons why companies in Kenya undertake stock splits is to bring the price down to an optimal range, which in turn increases and diversifies the ownership base to the liking of management. The research findings also deduced that stock splits does have a direct impact on the post-split share price

Policies on stock splits in Kenya were found to be biased on forward splits and the Capital Markets Authority needed to review this to enable firms undertake reverse splits. Furthermore the legal framework needs to be amended to allow reverse splits that allow consolidation of shares. The Capital Markets Authority Act of June 2004 is long overdue for review. Policy makers may therefore embark on this review so as to enable the market to practice reverse splits.

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THE PRESERVATION OF THE INSURED DEFINED BENEFIT PENSION PROGRAM

Anne S. Kelly, Butler University

ABSTRACT

Over the past twenty-five years, a downward trend in the number of insured defined benefit pension plans has surfaced despite efforts by governing bodies such as the U.S. Congress, the Pension Benefit Guaranty Corporation, and the Financial Accounting Standards Board to make changes to pension laws, regulations, and accounting standards. This paper presents a discussion of the benefits and negative implications of preserving this program from three different perspectives: (1) from a national fiscal policy viewpoint; (2) from the position of an employer providing such benefits; and (3) from the standpoint of the plan participant. Data is provided to support the discussions. The advantages for national fiscal policy and plan participants are several with few drawbacks. The impact on the employer is more complex and accordingly, a model is developed to depict the directional relationship between identified variables and the employer's choice to initiate and maintain a defined benefit plan. Several variables are hypothesized to have a negative effect on this choice. Reforms are recommended to encourage employers to continue as willing partners in this program including simplification of the relevant accounting and funding rules, incentives to eliminate unfunded pension obligations, emphasis of hybrid alternatives to traditional defined benefit plans, and implementation of risk-driven insurance premiums. The model is revised based on these recommendations.

INTRODUCTION

The United States (U.S.) private sector has provided pension plans for employees for more than a century. Their popularity grew after World War II motivated by wage and price controls, high corporate income taxes, and the 1948 decision of the National Labor Relations Board (NLRB) "that pensions were a mandatory subject for collective bargaining" (Coleman, 1985, p. xiv). Employee pensions, especially union plans, were usually offered as defined benefit (DB) plans where participants relied on plan sponsors to fulfill their promise of benefits (Seburn, 1991). The failure of Studebaker-Packard to honor its commitment of retirement benefits to participants triggered public outcry that ultimately led to the 1974 Employee Retirement Income Security Act (ERISA) (Brown, 2008). An integral part of ERISA was the creation of the federal corporation, the Pension Benefit Guaranty Corporation (PBGC), to protect millions of Americans from potential catastrophic loss of their promised retirement benefits as an insurer of DB pension plans.

Questions exist regarding the longevity of the DB pension system and the future ability of the PBGC to protect participants of these plans.

A private retirement plan is a discretionary employee benefit offered by an employer. Unlike Social Security where participation is mandated by the federal government, employers are not compelled to initiate or continue their pension plans. DB plans may be sponsored by specific corporate entities as single-employer plans or they can be established by more than one employer with collective bargaining units as multiemployer plans. This paper's discussion is limited to single-employer plans as they represent 27,647 of 29,142 plans or about 95 percent of the total number of plans insured by the PBGC and 33.6 of the 44 million or 76 percent of insured-plan participants (PBGC, 2009c). A defined contribution (DC) plan represents an alternative to a DB plan.

The U.S. Government Accountability Office (formerly the U.S. General Accounting Office (GAO)) placed the single-employer DB pension insurance program on its "high-risk list" in 2003 when its deficit was $11 billion (PBGC, 2003a) because it was financially weak and faced "serious, long-term risks to the program's future viability" (GAO, 2003, p. 3). No substantial improvements in the financial health of this program have occurred since this time; in fact, one could argue that the condition has actually weakened with its current deficit of $23 billion (PBGC, 2010a). Plans that are fully funded contribute premium revenue with no commensurate current risk to the PBGC. A sponsor of a fully-funded plan may execute a standard termination and settle their pension obligations typically by purchasing annuity contracts for their participants. When a fully-funded plan is terminated, it is removed from the PBGC insurance pool and as a result, the quality of the pool declines.

Many reasons have been posited for the movement away from DB plans (U.S. Department of Labor, 1997). Despite efforts by the U.S. Congress through legislation to enhance funding of DB plans and the Financial Accounting Standards Board (FASB) to enable transparency between a plan and its sponsor, the downward trend in the number of plans shows no signs of abating. In the following pages of this paper, the benefits and negative implications of the continuation of this program are discussed in the context of three different perspectives: (1) from a national fiscal policy viewpoint; (2) from the position of an employer providing such employee benefits; and (3) from the standpoint of a plan participant. This discussion leads to the development of an employer model where the relevant variables and their directional impact on the employer's choice to offer a DB plan are described. Data on the recent trends of the program are provided. Several recommendations for reform are presented and the model is revised accordingly.

BACKGROUND

Financial records for pension plan activities are separate and distinct from the plan sponsor. In addition, plan assets belong to the plan, although a fiduciary responsibility to protect plan assets for the benefit of plan participants rests with the plan sponsor. FASB indicates that

plan assets include "stocks, bonds and other investments – that have been segregated and restricted, usually in a trust, to provide for pension benefits" (FASB, 2009). Two liabilities, the accumulated benefit obligation (ABO) and the projected benefit obligation (PBO), impact the financial statements and related notes of a plan sponsor. The ABO is the actuarial present value of retirement benefits earned by an employee based on current and past compensation levels (FASB, 2010b). The PBO is the primary liability of DB pension plans for accounting purposes and represents the actuarial present value of all benefits associated with employee "service to date assuming that the plan continues in effect and that estimated future events (including compensation increases, turnover, and mortality) occur" (FASB, 2010a). Both the ABO and the PBO represent liabilities to participants for vested and nonvested benefits.

Types of Pension Plans

DB pension plans can be categorized as either traditional plans or hybrid plans. Traditional plans require plan sponsors to pay specific monthly benefits to participants during their retirement years. They "place a premium on employee tenure and discourage job mobility" (Cearley, 2006, pp. 205-206). Hybrid plans are a relatively new phenomenon and have attributes of both DB and DC plans. A cash balance plan is a common example of a hybrid plan where the benefit is defined as a stated account balance (U.S. Department of Labor, 2009). Two components form the employer's contribution to the plan each year, a percentage of every eligible employee's earnings and some specified rate of return on that contribution (Elliott & Moore, 2000). Cash balance plans resemble DC plans to participants because individual hypothetical accounts are maintained and the employer credits these accounts with a certain number of dollars each year (American Institute of Certified Public Accountants (AICPA), 2010, p. 15). They are considered DB plans because participant retirement benefits are based on a formula similar to traditional plans so that the employer bears the investment risk instead of the employee (Berry, 2009). An advantage of cash balance plans over traditional DB plans are that benefits are earned more evenly over an employee's career based on earnings rather than length of service (Curran, 2009). In addition, the account is portable which appeals to younger workers who may make multiple job changes throughout their careers (Elliott & Moore, 2000).

DC pension plans typically require employees to contribute to individual employee accounts established by their employers. Many employers also contribute on behalf of their employees; however, there is no guarantee of benefits and the employee is typically responsible for effectively managing these funds to allow for sufficient amounts to be available during their retirement years. Some companies have replaced their DB pension plans with DC plans (PBGC, 2007).

The PBGC

The PBGC is a federal entity which operates within the U.S. Department of Labor and its Board of Directors are members of the U.S. President's Cabinet, the Secretaries of Labor, Treasury, and Commerce. It has an Advisory Committee (Lucas & Furdek, 2008, p. 17) and a Director who are presidential appointees; the Director must be approved by the Senate. As a self-funding entity, the PBGC derives its revenues from non-tax sources primarily through its underwriting and investment activities, even though a thin veil separates the PBGC from those related departments that receive federal tax revenues. The PBGC can also "borrow up to $100 million dollars from the U.S. Treasury" to fund its obligations (Lucas & Furdek, 2008, p. 15, referring to Beam & McFadden, 2005).

Although the PBGC assumes several other roles, its primary role in the context of this paper is as an insurer of DB plans. Certain single-employer DB plans are exempt from coverage in the PBGC's insurance program including:

- Government and church plans
- Plans maintained by certain fraternal societies
- Plans established and maintained outside the United States for non-U.S. citizens
- Unfunded, non-tax-qualified deferred compensation plans for top executives
- Plans which do not provide for employer contributions
- Plans maintained solely to comply with workers' compensation, unemployment compensation or disability insurance laws (Coleman, 1985, p. 40).

With the exception of these plans, ERISA mandates that the PBGC insures all ongoing single-employer plans against plan termination. Over its lifetime, most single-employer PBGC-insured plans have ended through standard terminations when the plan has enough assets to settle its benefit obligations. The most common reason cited by plan sponsors is a desire to restructure employee benefits and there are no successor plans in the majority of cases (PBGC, 2007, p. 3).

The PBGC collects Congressionally-determined insurance premiums from plan sponsors to fund its underwriting activities. Although similar to private insurers, the PBGC operates in a significantly different environment. "Most private insurers can diversify or reinsure their catastrophic risks or apply traditional insurance underwriting methods to these risks" (PBGC, 2009a, p. 8). In contrast, the PBGC "cannot decline insurance coverage regardless of the potential risk posed by an insured" (PBGC, 2009a, p. 8), it lacks the flexibility to charge different premiums in response to the different levels of risk posed by plan sponsors, and it is unable to reinsure for catastrophic loss associated with potential terminations of severely underfunded or very large underfunded plans.

Plan Underfunding

Plan underfunding is defined differently by pension legislation as compared with the definition outlined in accounting standards. According to pension law, plan underfunding is based on a comparison of plan assets to the present value of vested benefits which are believed to best approximate the termination liabilities for which the PBGC is ultimately responsible. For accounting purposes, a plan is considered underfunded if the PBO (which includes both vested and nonvested benefits) exceeds the fair value of plan assets.

A DB plan may remain underfunded as long as the plan sponsor makes at least the minimum contributions to the plan required by law. A company can request a funding waiver from the Internal Revenue Service (IRS) when it is unable to contribute the legally-required minimum amount. "Accumulated funding deficiencies, in the absence of a funding waiver issued by the IRS, may result in an excise tax payable by the plan sponsor for failure to meet the minimum funding standards and in possible action by the IRS to enforce the standards" (AICPA, 2010, p. 272).

Underfunding often occurs when the plan sponsor does not contribute enough to the plan so that sufficient plan assets are purchased: (1) in an effort to cut costs by an employer in financial distress; (2) so that the cash can be used elsewhere in the corporation; (3) when the costs of continuing a DB plan have become too great in comparison to the advantages afforded the plan sponsor, especially when there is a drop in the proportion of active to total participants. Other reasons for plan underfunding include plan benefit increases which are not funded immediately, a decline in the fair market value of plan assets, and changes in actual experience as compared with the previous assumptions used (i.e. lengthening of participant or beneficiary life spans or lower than expected return on investments). When plans are underfunded, pension law requires deficit reduction contributions which place a greater financial burden on the plan sponsor who may already be in a precarious financial condition. It may be the tipping point that forces an employer to seek ways to remove this financial burden either by freezing or terminating their plans.

Plan Freezes and Terminations

As an employer begins a financial decline, a common strategy is to freeze its pension plan whereby a more precise estimate of the liability can be determined since additional benefits are not accrued. These employers continue to make contributions to their plans as long as they are financially capable. A DB plan can be frozen in a number of different ways: (1) closed plans are not available to new employees so that only participants in the plan at the time it was closed accrue benefits; (2) partial freeze occurs when access is restricted for some participants "based on age, tenure, job classification or plant location" (PBGC, 2005a, p. 2); (3) soft freeze is where participants accrue additional benefits based on compensation increases only; and (4) with "a hard-frozen plan, no new participants are being added, and no existing participants are accruing

any new benefits" (PBGC, 2007, p. 9). Closed plans and soft freezes often occur together and Aon Consulting groups them in one category in their research on frozen plans (Aon Consulting, 2009a, p. 2).   In a survey of plan sponsors with frozen DB plans, Aon found that

> 68 percent of those surveyed have reviewed the expected future cash needs associated with their pension plans and found that additional cuts, outside the pension plan, will likely need to be made. Interestingly, many organizations plan to make cuts in the areas of hiring and training (both new and existing staff) to address these needs (Klinck, 2009).

Plan sponsors continue to pay their required premiums and Kilgour (2007) indicates that "when an employer freezes a pension plan, it is permanent. The plan is never unfrozen" (p. 8).

The PBGC accrues estimated losses associated with probable plan terminations according to FASB (2011) on Contingencies using criteria which may include one or more of the following conditions: the plan sponsor is in liquidation or in an insolvency proceeding with no known solvent controlled group member; the sponsor has filed or intends to file for a successful distress plan termination; or the PBGC is considering the plan for involuntary termination (PBGC, 2009a, pp. 53-54). In addition, other factors are used in this determination including: the plan sponsor has received a going concern opinion from its independent auditors; the plan sponsor is in bankruptcy or has indicated that a bankruptcy filing is imminent; or the plan sponsor is in default under existing credit agreements (PBGC, 2009a, pp. 54). The latter two events may qualify as reportable events requiring advance as well as post-event notice to the PBGC.

DISCUSSION

National Fiscal Policy Viewpoint

Social Security

It is generally conceded that the future of Social Security is in jeopardy (Farnam, 2009) and it is anticipated that the system's trust fund will be "fully exhausted in 2037" without significant changes to the program (The National Commission on Fiscal Responsibility and Reform, 2010, p. 49). An in-depth analysis of the problems associated with Social Security is beyond the scope of this paper; however, a discussion of the implications for the private DB pension system is relevant. The National Commission on Fiscal Responsibility and Reform (2010) recently discussed alternatives to support the longevity of Social Security including a more progressive Social Security benefit formula, which slows the future benefit growth especially for high earners, and an increase in the early and full retirement ages as a result of extended life expectancy. Both of these recommendations must assume a viable private pension system to

offset the contraction or delay of Social Security benefits. The fundamental nature of DB pension plans ensures guarantees to employees by employers during retirement which is not true of DC plans. Therefore, a fiscal policy benefit would be less reliance on Social Security by employees who are attaining some minimum retirement income level attributable to their DB plans.

Moral hazard

The risks to the PBGC and the federal government are based in large part on the severe underfunding of plans associated with sponsors in financial difficulties and underfunding of very large plans. This underfunding issue is exacerbated by the moral hazard problem common to the insurance industry, where an insured may use less than optimal care to avoid the risks against which they are insured (Keating, 1991). For DB pension plans, moral hazard includes plan sponsor behavior which shifts the risk for satisfying benefit payments to the PBGC. Plan sponsors who are economically distressed are more likely to invest plan assets in more risky investments in the hope of reaping a higher return in order to minimize their contributions to the plan. Additionally, Keating (1991) indicates that moral hazard in this context is the "incentive to spend capital in ways other than funding pension plans" (p. 2). The federal government, through the PBGC, would benefit if moral hazard could be reduced.

Employer Perspective

Complexity, assumptions, and disclosures

The computation of net periodic pension cost (NPPC), the determination of the values of plan assets and benefit obligations, and the effects on other comprehensive income (OCI) all require complex calculations and assumptions for compliance with accounting requirements. In addition to these amounts, accounting standards require additional disclosures to be made in the financial statements and related notes of the plan sponsors.

According to accounting standards, plan sponsors recognize NPPC in their income statements and contributions to their pension plans as reductions of their cash accounts. Unlike DC pension plans, pension cost for DB plans rarely equals employer contributions. In the simplest case, NPPC is the combination of employee normal service costs and interest costs, while deducting expected return on plan assets. Current employee service costs consider actuarial assumptions about compensation increases, mortality rates, and employee turnover. Interest costs use an assumed discount rate on the liabilities of the plan. Expected return is based on estimates of the earnings on the portfolio of assets held in trust by the plan. The calculation of NPPC is further complicated by the arbitrary amortization of various gains and losses attributable to changes in investment and actuarial assumptions. Certain additional disclosures are required in the notes to the financial statements of the plan sponsor for reporting purposes and include: (1)

the composition of changes in plan assets and the PBO; (2) the ABO for all years presented in the financial statements; (3) the effects on NPPC for next year that arise from delayed recognition of gains/losses and prior service costs/credits; and (4) the benefits expected to be paid in each of the next five years and the sum for the subsequent five years beyond this window.

Transparency and the unfunded liability

Although plan assets and the liabilities associated with future benefit payments are not included in the plan sponsor's balance sheet, FASB requires that the funded status of DB plans be recognized in the balance sheets of their plan sponsors. Funded status is computed as the difference between the fair value of plan assets and the PBO. The rationale for including funded status is that plan sponsors are ultimately responsible for satisfying these obligations. In recent years, the funded status of many plans has been a noncurrent liability due to plan underfunding. Furthermore, any changes to the funded status of the plans must either be currently recognized in NPPC or reflected in OCI. For many companies, this unfunded liability can be substantial especially for plan sponsors of collectively-bargained plans.

The newest accounting requirement is the affect on OCI of various pension transactions. For example, prior service costs/credits and certain asset and liability gains or losses arise during a period but are not considered an expense in the current year. Hence, they are excluded from the computation of NPPC and must be reported in OCI. Furthermore, accounting standards specify that the plan sponsor must adjust OCI and current earnings for amounts previously included in accumulated other comprehensive income that are subsequently recognized as components of NPPC (FASB, 2010c).

PBGC insurance premiums

PBGC premiums are based on the number of participants with no distinction made between active, retired, and separated vested participants. With the enactment of ERISA in 1974, Congress set the flat-rate premium rate at $1 per participant for single-employer plans (Coleman, 1985, p. 40) and it has increased to $35 per participant by 2010 (PBGC, 2009c). A company that improves its efficiency while experiencing modest growth may encounter a decline in the proportion of active employees to total plan participants. As this shift occurs, there is less incentive for this plan sponsor to continue its plans. The insurance premium costs can be avoided by replacing its DB plans with DC pension plans or by discontinuing its plans altogether.

Legislation in 1987 established the variable-rate premium which has remained at $9 per $1,000 of unfunded vested benefits since 1991. Companies can incur the variable-rate premium when their plans are underfunded. The Pension Protection Act of 2006 (PPA) made two important changes with respect to this premium: 1) it removed an exemption permitting certain underfunded plans to avoid the variable-rate premium and 2) it modified the way in which

"underfunding is determined for variable-rate premium purposes" (PBGC, 2010b, p. 1). The full-funding-limit exemption had "enabled many large underfunded plans to avoid paying a variable-rate premium" (PBGC, 2005b, p. 11). This premium compensates the PBGC for the additional risk it assumes associated with the potential termination of these underfunded plans. Instead of maintaining funding levels to avoid this penalty, this additional cost may actually accelerate the number of plan terminations.

The Deficit Reduction Act of 2005 (DRA) introduced a new termination premium required to be paid by sponsors of "certain distress and involuntary pension plan terminations that occur after 2005" (PBGC, 2010b, p. 1). The typical annual premium is $1,250 per participant in each of the three years following a plan termination. This additional premium became permanent with the PPA (Federal Register, 2008), providing additional funding to the PBGC and potentially functioning as a deterrent to plan termination. The termination premium "is payable by a pension plan sponsor whose plan is terminated with unfunded benefits, and helps to offset some of the unfunded liabilities that terminating plans bring to the pension insurance program" (PBGC, 2009b, p. 4). Given the uncertainty of collecting this premium, the PBGC began to fully reserve for this amount in its 2009 financial statements. The National Commission on Fiscal Responsibility and Reform recommended that the PBGC be allowed to increase both the flat and variable-rate premiums in an effort to restore solvency to the PBGC. Simply increasing premiums could drive companies out of the DB pension plan market due to these additional insurance costs thereby placing more people in jeopardy of insufficient income during retirement.

Tax deductibility of employer contributions

When a DB plan is created as a trust, it is typically considered a qualified plan under the Internal Revenue Code (IRC) and the activities of the plan itself are exempt from federal income taxes. Yet, the contributions funded by the employer face a tax deductibility ceiling imposed by law so that the federal tax revenue stream is not negatively impacted (Cearley, 2006, p. 186). Immediately prior to the implementation of PPA, tax deductibility of employer contributions was disallowed "whenever the plan's assets exceed(ed) the greater of the plan's accrued liability and the plan's current liability" (PBGC, 2005c, p. 8). Pratt (2007) indicates that "in many cases plan sponsors have been prevented from making adequate contributions by the full funding limitation" (p. 51).

PPA immediately amended Section 404 of the IRC to modify the tax deductibility of contributions to DB pension plans by plan sponsors so that the limitation was "based on 150 percent of current liability" for single-employer plans (IRS, 2007, p. 2). Thereafter, the term current liability was eliminated and IRC defined the deduction limitation in terms of target funding which includes a cushion amount of at least 50 percent (IRC, 2010). Employers often contribute to DB plans to the extent that their contribution is tax deductible. Therefore, any

deductibility ceiling limits contributions to plans and in economic downturns when return on plan assets fall, plan underfunding is likely to occur.

Employer contribution complexity

The use of assumptions is also necessary to determine the employer contribution amount required by law from a plan funding perspective. These assumptions are made primarily by the plan sponsor's actuary in association with the plan trustee and investment adviser. Prior to PPA, funding rules allowed the actuary to set the value of plan assets using a formula that permitted smoothing of fluctuations in market value "by averaging the value over a number of years" (PBGC, 2005c, p. 8). Furthermore, an actuary often assumed a high expected return on plan assets invested in equities (PBGC, 2005c). PPA requires that assets "be valued between 90% and 110% of their fair market value on the plan's valuation date" (Kilgour, 2007, p. 17) and asset smoothing is reduced from four to two years (Pratt, 2007, p. 53). Another assumption involves the interest rate used to calculate target liabilities based on a "three-segment yield curve."

Liabilities will be grouped into three categories: those expected to be payable (1) within five years, (2) between five and 20 years and (3) after 20 years. The derived discount rate for each segment will be based on current market rates averaged over 24 months. Alternatively, plan sponsors may elect to use a single blended discount rate for all promised benefits. Once made, this election may be revoked only with Internal Revenue Service approval" (Kilgour, 2007, p. 17).

PPA also dictates the use of mortality tables developed by the Society of Actuaries which utilize more realistic estimates of life expectancy for men and women thereby closing the gap between expectations and reality (Kilgour, 2007).

Volatility and predictability of employer contributions

Respondents of Aon's 2009 survey indicated that financial volatility and the high cost of maintaining a DB plan were the top two reasons for considering terminating their hard-frozen plans or hard-freezing their soft-frozen plans (Aon Consulting, 2009b). DC pension plans reduce this volatility because employers have greater control over the amounts they contribute and the costs are more predictable (U.S. Department of Labor, 2001).

Employee recruiting

An employer that provides a DB pension plan should have a competitive edge in employee recruiting by providing this employee benefit which is not offered by all employers. Nevertheless, in their 2009 survey of companies with frozen plans, Aon Consulting (2009b) found that plan sponsors believed that employees don't appreciate their DB pension plans, so that

providing such a plan may not give an employer this perceived hiring and retention advantage in the employment marketplace. Furthermore, the national unemployment rate has seen little movement from its recent 9.5 percent level (Randall, 2010), reflecting an oversupply of labor in general. Therefore, incurring this additional cost may not be necessary in the current environment.

Collective bargaining

The National Labor Relations Act of 1935 (Wagner Act) "guaranteed the twin rights of workers to join labor unions and to bargain collectively" (U.S. Department of Labor, 2001, p. 58). At the same time, the War Labor Board had placed restrictions on cash-wage increases by employers in an attempt to manage the economic constraints and inflationary pressures of World War II. In response to this limitation, employers began to offer non-wage employee benefits to encourage a sufficient supply of labor to produce the growing demand of products necessary for the war effort. The coupling of the Wagner Act and the wage and price controls implemented by the War Labor Board ultimately led to the 1948 court decision in Inland Steel v. NLRB that unions had the right to bargain for retirement benefits, which along with health insurance, became the "mainstay compensation components of union contracts" (U.S. Department of Labor, 2001, p. 59).

Some plan sponsors periodically renegotiated pension and other post-retirement benefits with the collective bargaining units of their union employees in lieu of wage increases. Oftentimes, these plan amendments resulted in benefit improvements requiring the amortization of prior service costs for accounting and funding purposes. Certain plan sponsors agreed to plan amendments every few years so that their plans remained underfunded by these unamortized past service costs. Restrictions did exist but "only if the actuarial value of a plan's assets would be less than 60 percent of current liability after a plan amendment increasing benefits" (PBGC, 2005c, p. 8). Then, the employer had to post security in the amount of this difference if it exceeded $10 million (PBGC, 2005c). Although the PPA limited the ability of plan sponsors to increase benefits when a plan is underfunded (i.e. the target liability is less than 80 percent funded), this practice continues and when an employer becomes financially distressed, these promised benefits are difficult to fund (Kilgour, 2007).

Employee Standpoint

Several benefits of traditional DB plans exist for plan participants. The most important benefits are that the responsibility for managing the funds in these plans falls to the employer and some retirement benefit is guaranteed to the employee. These "plans insulate retirees from investment and mortality risk and are intended to be a source of stable retirement income"

(PBGC, 2008b, p. 1). Another advantage to the employee is that the PBGC insurance program protects the participant in the event that the employer is unable to pay the retirement benefits.

There are few disadvantages to the employee. The employee must rely on the employer to fulfill their promise of benefits. This factor has become troubling for employees who have seen the financial deterioration of some plan sponsors for which they work. The employee always encounters some risk that a DB plan will be terminated either voluntarily by the company through a standard termination or by the PBGC. Under both circumstances, the participant will receive some annual retirement benefit. For plans trusteed by the PBGC, the annual and monthly benefits are capped by the U.S. Congress each year. In this case, the employee may not receive all of the benefits declared in the pension agreement with the plan sponsor; however, the employee is assured of some benefits. Also, there remains a lack of full transparency between the plan and its sponsor. Although Statement of Financial Accounting Standards Number 158 required increased disclosures in the notes to the financial statements of plan sponsors, certain disclosures helpful to employees are not currently required by accounting standards including the type of audit opinion received by the plan, an assessment of the risk of plan termination, or reportable events required by the PBGC.

DC plan as an alternative

Some of the benefits of DC plans perceived by employees have negative fiscal policy implications. Employees can borrow or withdraw funds from DC plans prior to retirement. If the primary purpose of pension plans is to provide sufficient funds to workers during their retirement years, it is not desirable for employees to deplete their pension funds prior to retirement or to saddle their retirement accounts with debt. Also, employees often control the investment decisions for their DC plans. Although this quality of DC plans permits accounts which can be personalized for the needs of the employee, many employees are not sufficiently financially literate to adequately provide for their retirement needs.

EMPLOYER MODEL DEVELOPMENT

In order to explore the directional impact of the variables relevant to the employer's choice to initiate and continue a DB pension plan, a model of the relationships was developed. Based on the discussion in the previous section, three primary categories of variables were identified which form the basis of the model: (1) accounting standards; (2) pension legislation and regulations; and (3) other factors. Figure 1 depicts the Employer DB Pension Plan Model.

Figure 1: Employer DB Pension Plan Model
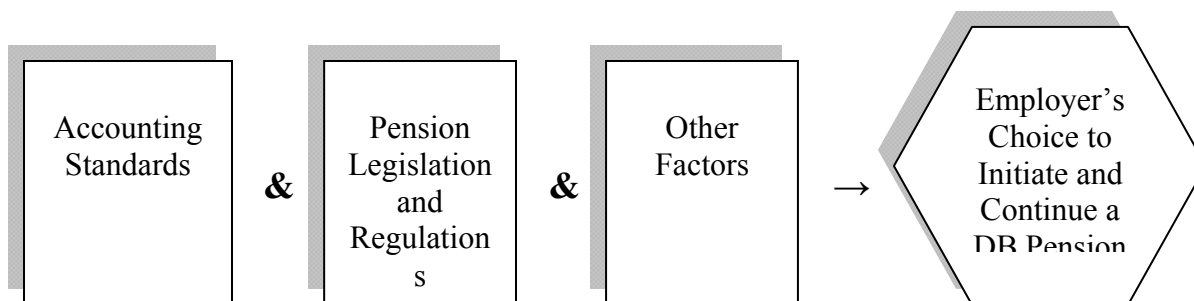
The accounting standards category includes three important variables and the hypothesized directional relationship between each variable and the employer's choice is described. First, the complexity of the pension cost computation is hypothesized to be inversely related to an employer's choice about a DB plan because more complexity and the associated cost may function as a deterrent. Second, the recognition of the funded status of the plan in the balance sheet may affect the employer's decision. If the plan is underfunded and a liability is determined, the plan sponsor's financial condition is adversely impacted and the decision to offer a plan is also likely to be negative. Conversely, if plan assets exceed the PBO where the plan is overfunded, the employer's balance sheet shows a higher total asset value and the employer's resulting decision may be a positive one. Third, accounting standards necessitate disclosures by the plan sponsor unique to offering a DB plan. These disclosures require expertise which translates into more costs to the employer. Therefore, these additional disclosures may inhibit the choice to offer a DB plan.

Variables associated with pension legislation and regulations include PBGC insurance premiums, the tax deductibility of the employer contribution, and employer contribution complexity, volatility, and predictability. As already noted earlier in this paper, all DB plan sponsors pay a flat-rate insurance premium to the PBGC on a participant basis where employers offering DC plans are not required to pay these premiums because there is no related insurance on the guarantee of benefits. Some employers also pay a variable-rate premium when their plans become underfunded. These premiums may have a negative impact on an employer's willingness to offer a DB plan. Furthermore, the tax deductibility of the employer contribution to the plan affects the decision where receiving a tax deduction provides an incentive to offer a plan. The final three variables in this category are all related to the employer's contribution: complexity, volatility, and predictability. As the computation of this contribution has become more complex and the resulting contribution is volatile and unpredictable, the more likely an employer will decide to forgo providing a DB plan.

Other factors include a variety of variables and the model explicitly considers five of them: (1) whether the plan is a hybrid rather than a traditional DB plan; (2) whether the plan

sponsor is subject to collective bargaining; (3) the proportion of active employees making up the participant pool; (4) whether the employer perceives that their employees appreciate the plan; and (5) the unemployment rate. The first four variables are hypothesized to be positively related to an employer's choice to offer a DB plan. The final variable may inversely related where a higher unemployment rate is associated with a lower desire. Figure 2 shows the model with the hypothesized directional impact of the variables on the employer's choice to initiate and continue a DB pension plan.

Figure 2: Employer DB Pension Model Including Directional Variables
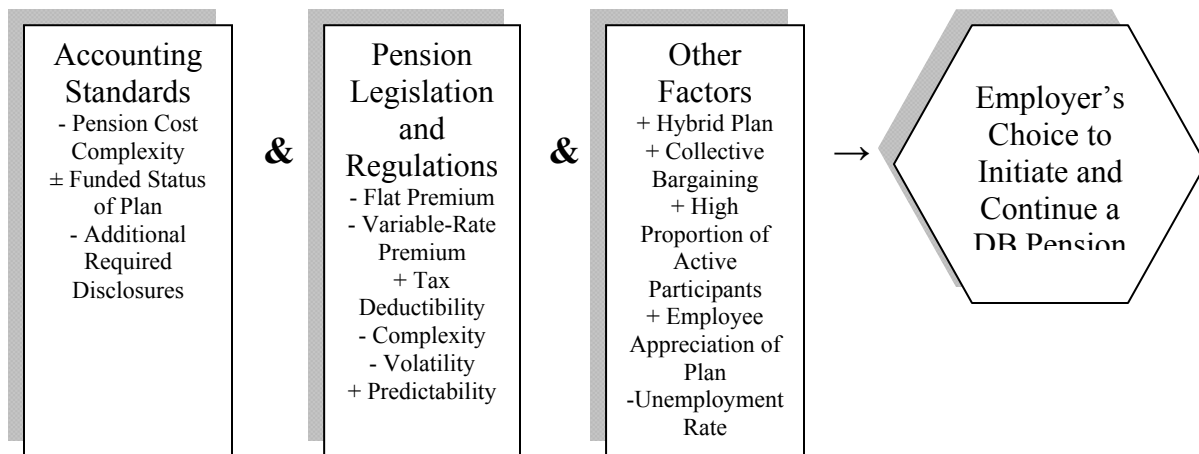
DATA TRENDS

Number of Plans and Participants

The number of single-employer plans insured by the PBGC has decreased substantially from a high of 112,208 in 1985 to a low of 27,647 in 2009. The number of insured participants in single-employer plans was 29.8 million in 1985 and has hovered around 34 million participants since 1998, even though the number has slightly declined since 2004. The most striking fact is the shift between active, retired, and separated vested participants since 1980 (the earliest year data is available) when the percentages were 77.6, 16.0, and 6.4, respectively, as compared with the most recent data available for 2007 of 41.1%, 26.4%, and 32.5%, respectively. This trend encourages some employers to seek retirement alternatives other than traditional DB plans. See Table 1.

			Categories of Participants		
Year	Number of Insured Plans	Number of Insured Participants (in thousands)	Percentage of Total Number		
			Active	Retired	Separated Vested
1980	95,439	27,518	77.6	16.0	6.4
1985	112,208	29,809	72.2	18.7	9.1
1990	91,899	31,633	68.1	19.4	12.6
1995	53,589	32,634	57.8	22.9	19.3
1996	48,748	32,724	55.3	23.0	21.8
1997	43,902	33,214	54.7	23.7	21.5
1998	41,462	33,545	54.2	23.8	22.0
1999	37,536	33,804	53.7	23.9	22.4
2000	35,373	34,108	51.9	24.4	23.7
2001	32,954	34,342	51.3	24.6	24.1
2002	31,229	34,248	49.8	25.2	25.0
2003	30,611	34,407	48.6	25.4	26.0
2004	30,148	34,523	47.2	26.1	26.7
2005	29,605	34,232	45.7	26.6	27.6
2006	28,923	33,933	44.8	27.1	28.1
2007	29,255	33,892	41.1	26.4	32.5
2008	28,876	33,888	NA	NA	NA
2009	27,647	33,606	NA	NA	NA

Table 1: Defined Benfit Plans and Their Participants

NA: Not available
Data is available from the PBGC Pension Insurance Data Book 2009.

The PBGC indicates that hybrid plans, including cash balance plans, constitute a growing segment of insured DB plans. Hybrid plans represented 3.7% of all PBGC-insured DB plans in 2001 and they accounted for 10.3% at the end of 2008. Kravitz, Inc. (2010), a retirement plan administrator, reveals that 1,755 new cash balance plans were established from 2002 through 2006 as compared with 571 new plans in the previous five-year period (Berry, 2009). Over this same period, the PBGC shows that the net increase in the number of insured hybrid plans was 889 plans or 72.5 percent while the total number of insured plans decreased by 4,031 plans or 12.2 percent. Refer to Table 2. Kravitz, Inc. (2010) further indicates that cash balance plans are offered by companies of different sizes in diverse industry classifications. Several S&P 500 companies have adopted cash balance plans including Avon Products, FedEx Corp., and the Williams Companies.

Table 2: Activity Associated with Hybrid Plans			
Year	Number of Insured Defined Benefit Plans	Number of Insured Hybrid Plans	Proportion of Hybrid Plans to Defined Benefit Plans (as a percentage)
2001	32,954	1,227	3.7
2002	31,229	1,308	4.2
2003	30,611	1,541	5.0
2004	30,148	1,756	5.8
2005	29,605	1,944	6.6
2006	28,923	2,116	7.3
2007	29,255	2,439	8.3
2008	28,876	2,984	10.3
Change, 2001 to 2006	(4,031)	889	
Percentage Change	Decrease 12.2%	Increase 72.5%	
Data is available from the PBGC Pension Insurance Data Book 2009.			

"Hewitt Associates surveyed about 1,000 large and midsize employers" offering pension plans to their salaried employees and this data is provided in Table 3 (Weber, 2008). The table contrasts the breakdown of traditional DB plans, DC plans, and cash balance plans as percentages of the total number of plans offered by employers. It is clearly evident that DC plans are an increasing proportion of the total from 21 percent in 1996 to 61 percent in 2008 and traditional DB plans show the opposite trend with 73 percent in 1996 and 21 percent in 2008. Cash balance plans gained popularity which has waned somewhat from its highest percentage of 24 percent of total number of retirement plans in 2004 to 18 percent in 2008.

Table 3: Historical Trend For Types of Pension Plans			
Year	Traditional Defined Benefit Plans (as a percentage)	Defined Contribution Plans (as a percentage)	Cash Balance Plans (as a percentage)
1996	73	21	6
1997	71	21	8
1998	66	23	11
1999	62	24	14
2000	58	27	15
2001	53	18	19
2002	48	31	21
2003	45	32	23
2004	44	32	24

Table 3: Historical Trend For Types of Pension Plans			
Year	Traditional Defined Benefit Plans (as a percentage)	Defined Contribution Plans (as a percentage)	Cash Balance Plans (as a percentage)
2005	38	39	23
2006	33	45	22
2007	27	54	19
2008	21	61	18
Data gathered by Hewitt Associates and reported by Weber (2008).			

Plan Underfunding

Data on plan underfunding is important to examine because underfunding increases the risk of plan termination and exposure for the PBGC and plan participants. Underfunded plans accounted for 18.6 percent of the total number of DB plans in 2000. This percentage climbed sharply to a high of 76.4 percent in 2005 and then declined somewhat to 54.3 percent of plans in 2007. The erosion is more pronounced regarding participants where only 7.2 percent of participants were associated with underfunded plans in 2000. This percentage increased and peaked at 85.9 percent of total participants in 2005. A decline was noted and 52.6 percent of participants were associated with underfunded plans in 2007. See Table 4.

Table 4: Underfunded Plans and Participants						
Year	Number of Insured Plans	Number of Underfunded Plans	Underfunded Plans as a Percentage of the Total	Number of Insured Participants (in thousands)	Number of Participants in Underfunded Plans (in thousands)	Participants in Underfunded Plans as a Percentage of the Total
2000	35,373	6,568	18.6	34,108	2,445	7.2
2001	32,954	12,004	36.4	34,342	9,057	26.4
2002	31,229	18,229	58.4	34,248	21,155	61.8
2003	30,611	22,233	72.6	34,407	30,129	87.6
2004	30,148	22,297	74.0	34,523	29,373	85.1
2005	29,605	22,631	76.4	34,232	29,394	85.9
2006	28,923	18,755	64.8	33,933	22,118	65.2
2007	29,255	15,886	54.3	33,892	17,843	52.6
Data is available from the PBGC Pension Insurance Data Books, 2002-2009.						

A further analysis of the relationship of underfunded plans to all insured DB plans on the basis of total assets or total liabilities yields interesting results. With the exception of 1996, underfunded plans accounted for 21 to 26 percent of total assets from 1995 to 1999. In 2000, the percentage dropped to an all-time low of 3.4 percent. From 2000 to 2003, underfunded plans

became more prominent and accounted for 78.0 percent of total assets in 2003. The disappointing trend improved somewhat, rebounding to 38.9 percent of total assets in 2007. At the same time (1995-1999), liabilities associated with underfunded plans ranged between 29 to 34 percent of total liabilities with the exception of 1996. This percentage decreased sharply where liabilities of underfunded plans represented 5.5 percent of total liabilities in 2000. The percentage of liabilities associated with underfunded plans climbed dramatically to 84.5 percent in 2003 and then declined gradually to 46.5 percent in 2007. Refer to Table 5. At the same time, the contribution of the top fifty plans to total underfunding peaked at 51.9 percent in 2001 and then declined to 31.5 percent in 2003 where it has remained, with the most recent percentage at 32.3 percent in 2007. See Table 6.

Table 5: Assets and Liabilities of Underfunded Plans						
Year	Underfunded Plans		All Plans		Underfunded as a	
	Assets (in million $)	Liabilities (in million $)	Assets (in million $)	Liabilities (in million $)	Percentage of the Total	
					Assets	Liabilities
1995	218,493	255,771	1,032,503	887,730	21.2	28.8
1996	493,597	576,668	1,198,221	1,134,194	41.2	50.8
1997	353,823	401,729	1,368,188	1,192,222	25.9	33.7
1998	358,514	407,756	1,491,488	1,284,725	24.0	31.7
1999	413,446	467,683	1,692,755	1,455,469	24.4	32.1
2000	63,218	69,784	1,836,184	1,271,347	3.4	5.5
2001	308,514	347,078	1,714,534	1,374,416	18.0	25.3
2002	778,351	920,925	1,444,777	1,435,558	53.9	64.2
2003	1,069,966	1,368,962	1,372,490	1,620,607	78.0	84.5
2004	1,229,811	1,551,642	1,590,057	1,860,514	77.3	83.4
2005	1,197,558	1,480,512	1,728,856	1,946,593	69.3	76.1
2006	971,052	1,156,935	1,840,181	1,910,563	52.8	60.6
2007	782,575	897,220	2,012,833	1,930,368	38.9	46.5

Note: Data prior to 1999 includes only plans with 100 or more participants.
Data is available from the PBGC Pension Insurance Data Book 2009.

Table 6: Plans with the Highest Underfunding				
Year	Total Underfunding for All Underfunded Plans (in million $)	10 Plans with the the Highest Underfunding (in million $)	Next 40 Plans with the Highest Underfunding (in million $)	Top 50 Plans Combined with Highest Underfunding (in million $)	Contribution of the Top 50 Underfunded Plans to the Underfunding Total (as a percentage)
1995	37,278	6,535	7,921	14,456	38.8
1996	83,071	13,850	16,410	30,260	36.4

Table 6: Plans with the Highest Underfunding					
Year	Total Underfunding for All Underfunded Plans (in million $)	10 Plans with the the Highest Underfunding (in million $)	Next 40 Plans with the Highest Underfunding (in million $)	Top 50 Plans Combined with Highest Underfunding (in million $)	Contribution of the Top 50 Underfunded Plans to the Underfunding Total (as a percentage)
1997	47,906	7,751	8,473	16,224	33.9
1998	49,242	14,432	6,942	21,374	43.4
1999	54,237	11,500	9,018	20,518	37.8
2000	6,566	1,631	1,077	2,708	41.2
2001	38,564	12,776	7,254	20,030	51.9
2002	142,573	33,691	25,933	59,624	41.8
2003	298,996	34,922	59,169	94,091	31.5
2004	321,831	34,899	62,414	97,313	30.2
2005	282,953	29,255	50,825	80,080	28.3
2006	185,883	23,881	31,663	55,544	29.9
2007	114,645	16,997	20,016	37,013	32.3
Note: Data prior to 1999 includes only plans with 100 or more participants. Data is available from the PBGC Pension Insurance Data Book 2009.					

The variable-rate premium is assessed on plan sponsors with underfunded plans and "is based on the level of a plan's unfunded liabilities" (PBGC, 2009c, p. 30). The associated premium revenue increased substantially in 2004 to $804 million when many plans became underfunded. As already noted, the PPA changed the full-funding exemption effective for the 2008 calendar year which had permitted many large underfunded plans to avoid the variable-rate premium. This revenue steadily declined until it spiked again in 2009 at $699 million due to the combined effects of the full-funding exemption change and the economic downturn on plan underfunding. See Table 7.

Table 7: PBGC Premium Rates and Premium Revenues by Category							
Year	Flat Premium Rate*	Variable Premium Rate**	Termination Premium Rate***	Flat-Rate Premium Revenue (in million $)	Variable-Rate Premium Revenue (in million $)	Termination Premium Revenue (in million $)	Bad Debt Expense (in million $)	Total Premium Revenue (in million $)
1985	2.60			81.7				81.7
1990	16.00	6.00		509.0	150.0			659.0
1995	19.00	9.00		587.0	251.0			838.0
1996	19.00	9.00		600.0	546.0			1,146.0
1997	19.00	9.00		646.0	421.0			1,067.0
1998	19.00	9.00		642.0	324.0			966.0

				Variable-			
Year	Flat Premium Rate*	Variable Premium Rate**	Termination Premium Rate***	Flat-Rate Premium Revenue (in million $)	Rate Premium Revenue (in million $)	Termination Premium Revenue (in million $)	Bad Debt Expense (in million $)	Total Premium Revenue (in million $)

Table 7: PBGC Premium Rates and Premium Revenues by Category

Year	Flat Premium Rate*	Variable Premium Rate**	Termination Premium Rate***	Flat-Rate Premium Revenue (in million $)	Variable-Rate Premium Revenue (in million $)	Termination Premium Revenue (in million $)	Bad Debt Expense (in million $)	Total Premium Revenue (in million $)
1999	19.00	9.00		611.0	291.0			902.0
2000	19.00	9.00		661.0	146.0			807.0
2001	19.00	9.00		674.0	147.0			821.0
2002	19.00	9.00		654.0	133.0			787.0
2003	19.00	9.00		647.0	301.0			948.0
2004	19.00	9.00		654.0	804.0			1,458.0
2005	19.00	9.00		664.0	787.0			1,451.0
2006	30.00	9.00	1,250.00	892.0	550.0			1,442.0
2007	31.00	9.00	1,250.00	1,057.0	358.0	61.0		1,476.0
2008	33.00	9.00	1,250.00	1,104.0	241.0	57.0	(62.0)	1,340.0
2009	34.00	9.00	1,250.00	1,129.0	699.0	590.0	(596.0)	1,822.0

* per participant
** per $1,000 of unfunded vested benefits
*** per participant per year for 3 years
The premium revenue by premium type for 2008 and 2009 were determined from the PBGC Annual Management Report Fiscal Year 2009. All other data is available from the PBGC Pension Insurance Data Book 2009.

Terminated, Frozen, and Trusteed Plans

From the beginning of 2000 until 2009, plan sponsors of 13,885 DB plans ended their plans through standard terminations where a plan must be fully funded or overfunded. Some data is available on plan freezes; however, the PBGC discloses information on hard freezes only (PBGC, 2009c, Table S-36). The PBGC reports that 2,898 DB plans or 9.5 percent of total number of plans were hard frozen in 2003 as compared with 5,273 plans or 18 percent of plans in 2007. In addition, 1,112 plans were trusteed by the PBGC from 2000 to 2009 because plan sponsors were unable to meet the benefit obligations of their plans due to bankruptcy or other qualifying situation. As a result, 3,993 single-employer plans had been trusteed by the PBGC by the end of fiscal year 2009 leaving an all-time low of 27,647 active DB plans. Refer to Table 8.

Table 8: Standard Terminations, Trusteed Plans, And Hard-Frozen Plans

Year	Number of Trusteed Plans	Number of Standard Terminations	Number of Insured Plans	Cumulative Number of Hard-Frozen Plans	Number of Hard-Frozen Plans as a Percentage of Insured Plans
2000	72	1,882	35,373		
2001	117	1,565	32,954		
2002	185	1,214	31,229		

Table 8: Standard Terminations, Trusteed Plans, And Hard-Frozen Plans					
Year	Number of Trusteed Plans	Number of Standard Terminations	Number of Insured Plans	Cumulative Number of Hard-Frozen Plans	Number of Hard-Frozen Plans as a Percentage of Insured Plans
2003	166	1,119	30,611	2,898	9.5
2004	163	1,189	30,148	3,626	12.0
2005	125	1,266	29,605	4,324	14.6
2006	79	1,248	28,923	4,760	16.5
2007	70	1,582	29,255	5,273	18.0
2008	59	1,590	28,876	NA	NA
2009	76	1,230	27,647	NA	NA
Total for period, 2000 to 2009	1,112	13,885			
Trusteed plans prior to 2000	2,881				
Cumulative total, end of FY2009	3,993				
NA: Not available Data is available from the PBGC Pension Insurance Data Book 2009.					

Ability of the PBGC to Meet Its Obligations

These factors have contributed to the deterioration of the financial health of the PBGC over the past decade. In 2000, the PBGC's single-employer program had a positive net position of $9,704 million which has subsequently fallen to a deficit of $21,594 million in 2010. The PBGC's deficit position indicates that the PBGC is unable to satisfy the actuarially-determined benefit obligations over the long-run even though it currently has the cash flow to pay these benefits as they come due (Burr, 2009).

The financial picture is even worse when one compares the assets of trusteed plans and probable terminations to the liabilities "that PBGC is or will be obligated to pay" to the participants in these trusteed plans (PBGC, 2009a, p. 52). In 2000, the 2,874 trusteed plans had a market value associated with its investments of revolving funds and trusteed plans of $19,953 million which exceeded the present value of future benefits of $10,631 million by $9,322 million. The financial position was grimly different ten years later with liabilities to participants for future benefits for the 4,140 trusteed plans of $90,022 million, dwarfing the market value of investments related to these trusteed plans of $64,708 million by $25,314 million in 2010.

The dollar amount of annual benefit payments to single-employer payees of trusteed plans has skyrocketed from $902 million in 2000 to $5,467 million in 2010. The number of these payees receiving benefits from the PBGC has more than tripled in ten years from 226 thousand to 748 thousand. At the same time, the number of participants in PBGC-trusteed plans substantially increased from 541 thousand to 1,387 thousand. As a result, the number of current payees has increased from 41.8 percent to 53.9 percent of participants in plans already trusteed by the PBGC.

These trends do not bode well for the ability of the PBGC to continue on the current course. See Table 9.

Table 9: Ability of the PBGC to Meet its Single-Employer Plan Obligations		2000	2010
Assets	in million $	20,715	77,827
Liabilities	in million $	11,011	99,421
Net Position (Deficit)	in million $	9,704	(21,594)
Trusteed Plans & Probable Terminations:			
Investments of Revolving Funds & Trusteed Plans			
Basis	in million $	15,731	55,118
Market Value	in million $	19,953	64,708
Present Value of Future Benefits (PVFB)	in million $	10,631	90,022
Market Value Minus PVFB	in million $	9,322	(25,314)
Trusteed Plans:			
Cumulative Number of Trusteed Plans & Pending Trusteeships		2,874	4,140
Number of Participants in Trusteed Plans	in thousands	541	1,387
Dollar Amount of Annual Benefit Payments	in million $	902	5,467
Number of Payees from the PBGC	in thousands	226	748
Proportion of Payees to Trusteed Participants		41.8%	53.9%
Selected data is available from the PBGC 2000 and 2010 Annual Reports and the PBGC Pension Insurance Data Book 2009.			

RECOMMENDATIONS FOR REFORM

Changes to the insured single-employer DB pension program should be considered to encourage employers to be willing partners in a healthy private retirement system. Most importantly, the program should be simplified to reduce the costs to employers. These simplifications may lead to theoretically imperfect accounting and funding requirements; however, the current system is unsustainable as the weight of the current requirements is likely to adversely affect the desire of employers to begin or continue DB plans. The U.S. Congress and FASB should work together to more closely align pension cost recognized in the income statement with funding requirements which specify the employer contribution amounts. Their joint objective should focus on reduced volatility, enhanced predictability, and consistency between NPPC and cash contributions to the plan. The unfunded pension liability required to be recognized in the plan sponsor's financial statements adds to the accounting complexity. A movement toward fully-funding a company's pension obligation can contribute to a reduction of this complexity.

PBGC insurance premiums should be structured based on the financial risk posed by the plan sponsor to the PBGC. This premium configuration should include a minimum risk premium threshold whereby the PBGC can refuse to insure a DB plan if the risk assumed by the PBGC is too high. This feature would necessitate a more active role by the PBGC in assessing the financial health of plan sponsors and in initiating involuntary plan terminations if employers exceed the risks acceptable to the PBGC. This approach could arrest the historical trend of large substantially underfunded plans deepening the deficit position of the PBGC. As a result, some employers could see lower premium rates if they fully fund their plans thereby further reducing the risks to the PBGC of assuming an underfunded plan. These changes should lead to greater financial health of the PBGC permitting it to continue to serve a vital role in the future.

Legislators should not endorse a tax policy that limits the tax deductibility of employer contributions to DB pension plans in order to provide for additional general taxation revenues. On the contrary, employers should be encouraged to contribute more in their good financial years in an effort to pre-fund their plans to protect participants in their sparse financial years. The higher the employer contributions to pension plans, the more plan assets are available to reduce plan underfunding. The U.S. Congress should view the single-employer DB pension program as a complement to Social Security and not as a contributor to the general federal tax revenue stream. Lower insurance premiums for less risky plan sponsors and higher tax deductions for plan sponsors willing to make additional contributions to their plans should reduce the significant moral hazard problem that currently exists.

The growth in the number of hybrid plans is already apparent and offering hybrid plans has the benefit of appealing to younger and less expensive employees. Positive attributes of hybrid plans include greater understandability, less employee risk, and portability. These features can also contribute to increasing the proportion of active employees to total plan participants and thus, improve the longevity of these plans.

REVISED EMPLOYER MODEL

The employer DB pension plan model is revised based on the reform recommendations for the single-employer DB pension program described in the previous section. Reduced complexity associated with the pension cost calculations required by accounting standards may encourage some employers to maintain their existing plans. Furthermore, if companies are permitted to pre-fund their plans, the funded status will be more likely an asset rather than a liability enhancing the financial condition of the plan sponsor. No changes are recommended to the required disclosures as transparency between a plan and its sponsor is important to plan participants and other financial statement users.

Changes are also recommended to the variables associated with the pension legislation and regulations category. Specifically, risk-driven premiums should be implemented which would replace the current flat and variable-rate premium structure. In addition, employer

contributions to DB plans ought to be fully tax deductible. Both recommendations would encourage employers to increase their contributions to their plans and could have a positive impact on plan initiation and continuity. A reduction in the employer contribution characteristics of complexity and volatility as well as increased predictability is hypothesized to also encourage DB plans. No changes were recommended to the variables falling into the final category of other factors.

Figure 3: Employer DB Pension Model with Reforms Including Directional Variables
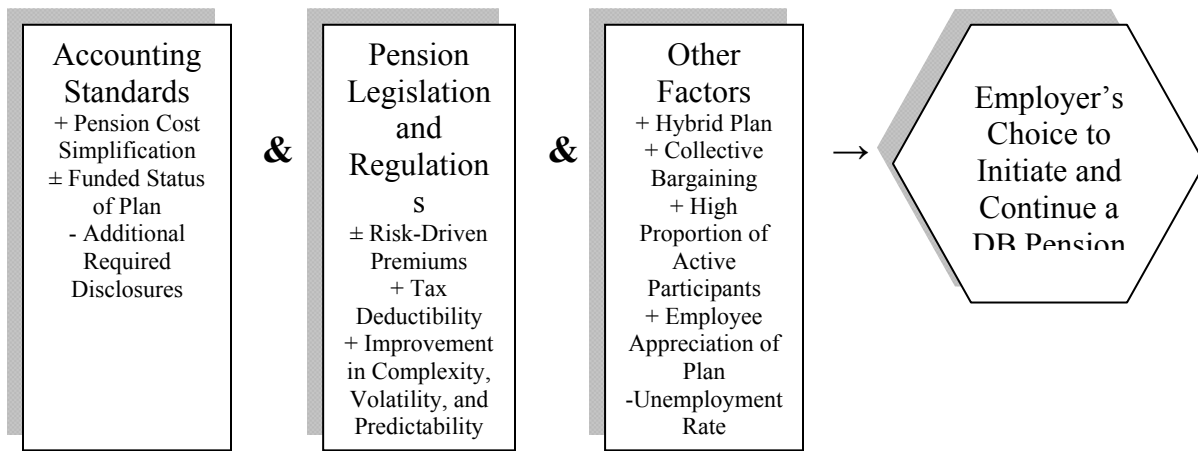
SUMMARY AND CONCLUSIONS

There are competing interests associated with DB pension plans and it is advantageous to national fiscal policy and to employees for a financially-healthy single-employer DB program to thrive in the future. From a fiscal policy perspective, a viable DB pension system shifts the responsibility for retirement benefits from the public arena as Social Security to the private sector. It is desirable for the federal government to return to its status as a safety net rather than the primary retirement vehicle for many Americans. This role is threatened as the PBGC continues to assume underfunded terminated plans and their financial responsibilities to participants of these plans have ballooned during the last ten years.

Additional data suggests that plan underfunding persists and negatively impacts both the viability of the PBGC and the willingness of employers to continue their plans. The percentage of underfunded plans to the total number of plans as well as the proportion of participants in underfunded plans currently rests at more than fifty percent. Also, assets and liabilities of ongoing underfunded plans represent roughly thirty-nine percent of total assets and forty-seven percent of plan liabilities that are vested and guaranteed by the PBGC. Underfunding based on accounting standards is more severe than underfunding disclosed by the PBGC because

accounting standards require inclusion of all liabilities associated with the plans. Furthermore, large underfunded plans account for more than thirty-two percent of total underfunding.

The participant composition of DB plans has also changed over time. Active employees dominated the participant pool in 1980. In the intervening years, insured DB plans have experienced a substantial shift to retired and separated vested participants. At the same time, the number of insured plans declined substantially to an all-time low in 2009. DC plans have replaced some of these plans; however, the PBGC indicates that the majority of standard terminated plans have no successor plans. In addition to plan terminations, the data indicates that eighteen percent of insured plans are hard-frozen and hence, participants no longer accrue retirement benefits under these plans. Therefore, many employees must assume the burden of establishing and managing their own retirement plans. From the employee's point of view, it is often preferred that pension management be left to the experts where the employer bears the risk of providing retirement benefits to participants according to the plan agreement. The evidence suggests that the employer and plan sponsor may not share this preference for DB pension plans.

Although the benefits to national fiscal policy and employees are clearly evident, there are numerous competing variables which impact an employer's decision to initiate and continue a DB pension plan. In order to explore the relationship of these variables to the employer's choice, a model is developed which provides the basis for testing in future research. The model considers three categories of variables including accounting standards, pension legislation and regulations, and other factors. The variables are described and the directional impact of each variable on the employer's decision to offer a DB plan is hypothesized. Several recommendations for reform are presented to encourage the continuation of this program specifically targeted to enhance the willingness of employers to offer DB pension plans. The employer model is revised based on the proposed reforms which include simplification of accounting and funding rules, incentives to eliminate unfunded pension obligations including full tax deductibility of the employer contributions, emphasis of hybrid alternatives to traditional DB plans, and implementation of PBGC risk-driven insurance premiums.

ACKNOWLEDGEMENTS

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