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LETTER FROM THE EDITORS

Welcome to the *Academy of Accounting and Financial Studies Journal.* The editorial content of this journal is under the control of the Allied Academies, Inc., a non profit association of scholars whose purpose is to encourage and support the advancement and exchange of knowledge, understanding and teaching throughout the world. The mission of the *AAFSJ* is to publish theoretical and empirical research which can advance the literatures of accountancy and finance.

As has been the case with the previous issues of the *AAFSJ*, the articles contained in this volume have been double blind refereed. The acceptance rate for manuscripts in this issue, 25%, conforms to our editorial policies.

The Editors work to foster a supportive, mentoring effort on the part of the referees which will result in encouraging and supporting writers. They will continue to welcome different viewpoints because in differences we find learning; in differences we develop understanding; in differences we gain knowledge and in differences we develop the discipline into a more comprehensive, less esoteric, and dynamic metier.

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FURTHER EVIDENCE ON THE FACTORS AND VALUATION ASSOCIATED WITH THE LEVEL OF ENVIRONMENTAL LIABILITY DISCLOSURES

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ABSTRACT

We find that the level of environmental GAAP disclosure is associated with profitability, and that this level of environmental GAAP disclosure is relevant to investors. We also find that the effect of profitability on the level of environmental GAAP disclosure, and the effect of the level of environmental GAAP disclosure on market valuation, depends on whether the disclosures confirm the concurrent corporate goals of profit maximization and environmental responsibility. Lastly, we provide descriptive evidence of environmental GAAP disclosure practices over time.

INTRODUCTION

The increasing emphasis on social responsibility by various corporate stakeholders and constituents makes the reporting of environmental obligations a prominent issue for accounting regulatory and professional bodies, as well as accounting academic researchers. We aim to extend our knowledge about the determinants and market value of environmental liability disclosures by focusing on the reporting requirements outlined by the Financial Accounting Standards Board (FASB) and the U. S. Securities and Exchange Commission (SEC), which collectively form the generally accepted accounting principles for environmental liabilities (henceforth called "environmental GAAP"). Insight on the economics of environmental disclosure practices helps stakeholders to assess the impact of environmental obligations, provides regulators with input on the need for additional reporting guidance, and helps researchers develop the theoretic aspects of social responsibility disclosure.

In this study, we investigate how financial performance, presented under alternative communication strategies, is related to the firm's level of environmental GAAP disclosures, and whether these same disclosures affect investor's valuation of stock price. Previous findings on the relations between financial performance, environmental disclosures (required or voluntary), and corresponding market valuation are mixed. Studies by Neu, Warsame, and Pedwell (1998), Berthelot, Cormier and Magnan (2003a), Cowen, Ferreri, and Parker (1987), and Patten (1991) contain mixed results on financial performance and environmental disclosure. Arguments by Porter and van der Linde (1995) and Al-Tuwaijri, Christensen, and Hughes (2004) suggest that firms that make forthcoming disclosures about their environmental activities will be positively rewarded and most accounting research indicates a negative reward. We hope to provide insight on these ambiguities in the literature by studying a comprehensive set of environmental disclosures based on GAAP in the context of alternative communication strategies. Managers can use different communication strategies to frame environmental disclosures with the intent of influencing investor's perception of

environment and operating performance. For example, managers could frame information in a way that educates stakeholders about environmental activities or changes the focus of stakeholder attention away from environmental activities, or managers could decide to not frame the information at all and let investors draw their own conclusions. While GAAP disclosures are presumably triggered by specified events, there is significant latitude in environmental GAAP (particularly with the qualitative disclosures) so that managers have discretion in how the environmental issues are framed and presented to stakeholders. In support of this idea, several studies provide evidence of the discretion exercised by organizations in making the required environmental disclosures (Rockness, Schlacher, and Rockness 1986, Freedman and Stagliano 1995, Berthelot, Cormier and Magnan 2003b).

Our findings indicate that the level of environmental GAAP disclosures provided in 10-K reports is significantly related to the firm's profits; however, the sign of the relation is conditional on the nature of the firm's communication strategy. We observe a positive relation between environmental GAAP and profits when the firm provides the information in the context of confirmatory environmental disclosures; negative otherwise in the context of non-confirmatory disclosures. Consistent with Neu, Warsame, and Pedwell (1998), we define a confirmatory disclosure as one intended to give "confirmation" that profitability has not been at the expense of the environment. These disclosures are intended to correct the misperceptions by stakeholders that financial success and environmental responsibility are incompatible.

Stakeholders, however, are free to interpret the implications of how the GAAP disclosures are framed, and so as a follow-up we test the market valuation of these same environmental disclosures. We find that stock returns are significantly related to environmental GAAP, but the magnitude of the impact of environmental GAAP on stock returns is also conditional on the disclosure strategy. We observe a negative relation between stock returns and environmental GAAP, but a smaller impact when environmental GAAP is provided in the context of confirmatory disclosures (although still negative overall).

In general, our results indicate that the level of environmental GAAP disclosed by managers and interpreted by investors is related to firm-specific financial success and how that financial success is framed. A confirmatory framework about environmental liabilities allows managers to address the skepticism of simultaneously achieving financial success and acting responsibly towards the environment. Thus, confirmatory disclosures are a proactive attempt to set expectations that environmental remedies will lead to operating benefits, possibly those described by Porter and van der Linde (1995), which should be credible since stakeholders can readily verify environmental information from regulatory sources. Al-Tuwaijri et al. (2004) describe the ability to verify the transparency of environmental disclosures by using data sources published by the EPA or other agencies. The negative relation between environmental GAAP and profits in the context of non-confirmatory disclosures suggests that managers cannot or will not commit to the joint pursuit of financial success and environmental responsibility, and therefore, disclose less about their environmental activities. Investors perceive as much and penalize the stock price, accordingly.

An important implication in our study is that the mixed findings on the environmental-disclosure-to-profits relation in previous research may be due to an omitted variable for communication strategies. In our empirical analysis, controlling for the use of a confirmatory disclosure framework has a significant effect on the environmental-disclosure-to-profits and the returns-to-environmental-disclosure associations. The observed results when environmental GAAP is presented in the context of confirmatory disclosures provides further support for Porter and van der Linde's (1995) proposition that good financial performance and good environmental performance can co-exist.

Finally, we provide descriptive evidence that the percentage of environmental GAAP disclosures made by Potentially Responsible Parties (PRPs) has not kept pace with the increase in the total number possible. Before 1993, firms provided about 51 percent of the total number of environmental GAAP disclosures possible. After the implementation of Staff Accounting Bulletin No. 92 in 1992, firms provided about 29 percent of the total environmental GAAP disclosures possible suggesting that there may be an issue of compliance or pertinence related to the additional environmental GAAP.

The remainder of the paper is structured as follows: the next section reviews the regulatory environment and academic literature; Section 3 develops and presents the testable hypotheses; Section 4 introduces the model and sample and Section 5 provides the empirical results; Finally, Section 6 contains some concluding remarks.

ENVIRONMENTAL REGULATIONS AND BACKGROUND

Institutional Background

Environmental regulations define environmental costs and the related disclosures. Statement of Position 96-1, *Environmental Remediation Liabilities*, summarizes the regulatory process with regard to the Superfund Act (AICPA, 1996). The Superfund Act adopted a "polluter pays" philosophy by establishing the right to bill firms associated with sites for their portion of the remediation costs and levying a tax on certain industries to fund orphaned sites. Several features of the Superfund Act present challenges for estimating a firm's liability under its provisions. First, the liability is comprehensive, including response and remediation costs, as well as damages, health assessments, and study costs. For estimates of the environmental costs involved, see Alciatore, Dee, and Easton (2004). Second, the Superfund Act imposes liability on a broad group of PRPs that includes the site's current owner, and anyone who: (1) owned or operated the facility when hazardous substances were disposed, (2) generated hazardous substances disposed of at the facility, or (3) transported hazardous substances to the disposal facility, and/or arranged for such transportation. Third, the Superfund Act liability is strict, retroactive, and joint and several. Thus, a study of environmental obligations under the Superfund Act is of high interest to a variety of publics because these obligations are some of the largest obligations for publicly traded corporations, can extend well into the future, and may be among the most difficult of costs to predict.

Accounting Requirements

Professional standards provide recognition and disclosure requirements with respect to environmental liabilities. The most relevant accounting guidance related to environmental liabilities is the Statement of Financial Accounting Standards Number 5 (SFAS 5), Accounting for Contingencies (FASB, 1975), which establishes both recognition rules and disclosure rules for contingent liabilities. SFAS 5 states that a loss contingency must be accrued if it is both probable and reasonably estimable.

In addition to the requirements of SFAS 5, firms must comply with guidance issued by the SEC. Most relevant to the current study is Regulation S-K (revised in 1986): Items 101, 103, and 303 (SEC, 2000), and Staff Accounting Bulletin 92 (SAB 92) (SEC, 1993). Item 101 requires a general description of the business and specific disclosure of the effects that compliance with environmental laws may have on capital

expenditures, earnings, and competitive position, when material. Item 103 requires disclosure of pending or contemplated administrative or judicial proceedings, and Item 303 requires disclosure of material events and uncertainties known to management that would cause reported financial information to be unrepresentative of future operating results or financial conditions. SAB 92 was issued specifically to improve the disclosure of environmental liability information. As the sample period for the current study is 1991-1997, we do not include the requirements of FAS 143, Accounting for Asset Retirement Obligations (Issued June 2001) or FASB Interpretation No. 47 (FIN 47), Accounting for Conditional Asset Retirement Obligations (Issued March 2005).

In summary, the total number of disclosures that a PRP may have to make related to environmental liabilities is broken down as follows: 6 possible environmental disclosures required under SFAS 5, 4 possible under Regulation S-K, and 19 possible disclosures under SAB 92. Our study relies on these 29 items to measure the level of environmental disclosure in 10k reports.

RELATED LITERATURE

The focus of environmental accounting research can be either on voluntary or mandatory disclosures. The voluntary environmental disclosure stream provides important insights for required environmental disclosures, especially in light of the discretion exercised by managers with the GAAP-based reporting guidelines (Berthelot, Cormier, and Magnan 2003b, Neu, Warsame, and Pedwell 1998, and Cormier and Magnum 1999).

Early studies based on anecdotal evidence suggested firm's environmental disclosures were self-serving and inaccurate (Beams and Fertig, 1971; Estes, 1976; Churchill, 1978; Nader, 1978), while later empirical studies questioned their quality and content adequacy (Gamble, Hsu, and Radke, 1995; Freedman and Wasley, 1990; Rockness, 1985; Wiseman, 1982, Ingram and Frazier, 1980). The dependability of firms to report environmental debts is apparently subject to discretion. Rockness, Schlacter, and Rockness (1986) report that most firms in their study do not mention, let alone quantify, the possibility of an environmental debt even though the firm has been identified as responsible for at least one contaminated site. Freedman and Stagliano (1995) report that one-quarter of their sample of superfund-affected firms does not disclose any information about their superfund issues. Other descriptive research suggests that environmental disclosure quality is generally low, and that firms generally do not record environmental liabilities (Price Waterhouse, 1992, 1994; Gamble et al., 1995; Kreuze, Newell, and Newell, 1996; Walden and Schwartz, 1997).

Previous research on the market effects of mandatory environmental disclosures is mixed. Li and McConomy (1999) and Berthelot, Cormier, and Magnan (2003a) find the adoption of environmental reporting standards lowers stock price, while Blacconiere and Northcut (1997) find a positive relation between returns and environmental information in the time leading up to the adoption of the Superfund amendments. Consistent with Blacconiere and Northcut (1997), Freedman and Stagliano (1991) and Blaconniere and Patten (1994) find there is less of a stock price penalty imposed by investors on firms disclosing environmental information. However, these firms are still penalized overall, which seems to be inconsistent with arguments by Porter and van der Linde (1995) who suggest that firms that make forthcoming disclosures about their environmental activities will be positively rewarded.

Recently, Hughes and Reynolds (2001) and Bae and Sami (2005) examine earnings response coefficients (ERCs) for firms with environmental liabilities. Hughes and Reynolds (2001) find higher ERCs

for high polluters than low polluters in times of higher uncertainty about environmental costs. Bae and Sami (2005) find lower ERCs for PRP firms than non-PRP firms, a finding that is seemingly at odds with Hughes and Reynolds (2001) if we assume that association with a PRP raises the uncertainty about environmental costs.

Previous research examining the association between environmental GAAP (or voluntary environmental disclosure) and profitability generally provides mixed findings. Berthelot, Cormier and Magnan (2003a) find that accounting provisions for site removal and remediation specified under Canadian Institute of Chartered Accountants' standards are positively associated with changes in earnings. For the relation between voluntary environmental disclosure and profitability, Cowen, Ferreri, and Parker (1987) and Patten (1991) document an insignificant relation, Cormier and Magnan (1999) document a positive relation, while Neu et al. (1998) document a negative relation. Our paper adds to this research by testing for differences in how managers present, and investors interpret, environmental disclosures under alternative communication strategies.

HYPOTHESES DEVELOPMENT

Hypotheses for the Level of Environmental GAAP Disclosure

We propose that corporate managers are concerned with the implications that financial performance holds for the perception of responsible social behavior. Therefore, managers will use disclosure to explain environmental actions to the firm's important stakeholders. As previous research suggests, investors could infer that profitability was at the expense of the environment (i.e., reduced environmental protection effort). Otherwise, as Porter and van der Linde (1995) imply, investors could infer that profitability was at the benefit of the environment (i.e., converting waste into saleable byproducts). Either way, a salient financial performance indicator such as profits, provides different incentives for the manager to influence perceptions of the firm's environmental behavior.

The above discussion suggests that disclosures could be used to frame information that is released to primary constituents. Similar to a dichotomy suggested by Neu et al. (1998), we propose that environmental disclosures can be confirmatory or non-confirmatory. A confirmatory communication strategy would provide information that informs constituents that financial performance and environmental responsibility are compatible, and educates constituents how that compatibility will be sustained or achieved. We also propose that in order for confirmatory disclosures to meet the needs of forward-looking investors, the disclosures would have to be credible. On the other hand, non-confirmatory disclosures could frame information in a way that redirects the focus of constituents away from the issue of financial performance and environmental compatibility, or would simply not address the compatibility issue at all. The scrutiny given to large, publicly traded corporations suggests that managers are not likely to provide disclosures that redirect attention or are intended to deceive constituents. Managers of large corporations are more likely to remain "silent" on matters they cannot explain or cannot conscientiously guarantee. Therefore, in this setting, we assume that a non-confirmatory approach is one where the manager minimizes or reduces the disclosures on the concurrent goals of corporate profitability and environmental responsibility.

Our first prediction is that profits affect the manager's decision to disclose information about corporate environmental issues. We do not predict a sign for the first prediction since our interest here is to

focus on whether environmental GAAP, as opposed to voluntary environmental disclosure, is affected by profits at all. This allows us to test overall, cross-sectional variation, and tie our results to previous research. Stated in alternative form, our first hypothesis is:

H1: The level of environmental GAAP disclosed is associated with profitability.

Our second prediction is that communication strategy in terms of providing disclosures in a confirmatory or non-confirmatory framework is a conditioning factor in how profits affect the disclosure level of environmental GAAP. Under a confirmatory framework, managers will make credible disclosures to convince investors that profitability and environmental responsibility are congruent corporate objectives, and the concurrent pursuit of both will lead to improved competitive position and higher future returns. Under a non-confirmatory framework, managers will not or cannot pursue the concurrent objectives of profitability and environmental responsibility. Without a credible commitment, the manager's best option is to curtail disclosures about the relation between profits and environmental responsibility. Our second and third hypotheses are:

H2: Given a confirmatory framework, the level of environmental GAAP disclosed is positively associated with profits.

H3: Given a non-confirmatory framework, the level of environmental GAAP disclosed is negatively associated with profits.

Hypotheses for Market Effects

In capital markets, investors will determine whether the environmental disclosures made by managers are useful in valuation or not. If investors perceive the environmental disclosures as credible, they may be willing to assign positive value to those disclosures that are confirmatory about the compatibility of environmental responsibility and financial performance. Porter and van der Linde (1995) suggest that operating decisions in favor of protecting the environment could improve performance as companies become efficient in using raw materials or turn waste into saleable byproducts. If managers do not provide confirmatory disclosures (i.e., they are non-confirmatory), then investors may interpret this to mean that managers are not willing to commit to the dual objectives of environmental responsibility and higher financial performance. Our fourth hypothesis predicts a significant relation between market returns and environmental GAAP disclosures. Our test of this hypothesis will help us tie our findings to similar tests in previous research.

H4: Market returns are associated with the level of environmental GAAP disclosed.

Our fifth and sixth hypotheses suggest the market valuation of environmental GAAP will differ under confirmatory and non-confirmatory disclosure frameworks as follows:

H5: Given a confirmatory framework, market returns are positively associated with the level of environmental GAAP disclosed.

H6: Given a non-confirmatory framework, market returns are negatively associated with the level of environmental GAAP disclosed.

In sum, the predictions for investor's valuation of environmental GAAP are similarly based on the same reasoning that managers have for framing disclosures about environmental GAAP: confirmatory disclosures will be perceived favorably due to the implied future benefits, and the lack of confirmatory disclosures will not be perceived favorably.

MODELS, VARIABLES, AND SAMPLE

Environmental GAAP Disclosure Model

The general form of our model is as follows:

Environmental GAAP Disclosure = ƒ (Firm-Specific Characteristics, Industry Related Characteristics, and Financial Performance).

Substituting empirical proxies, we use the following regression model to test our hypotheses related to the determination of environmental GAAP.

$$ENVGAAP = \alpha_0 + \alpha_1 ln(SIZE) + \alpha_2 CHEM + \alpha_3 OIL + \alpha_4 PAPER + \alpha_5 STEEL + \alpha_6 POWER + \alpha_7 ENVLIAB + \alpha_8 SITES + \alpha_9 POSTSAB92 + \alpha_{10} CAPX + \alpha_{11} ROA + \varepsilon.$$

Dependent Variable for Environmental GAAP Model.

To measure the level of disclosure, we construct a comprehensive index of environmental liability disclosures based on the requirements in Regulation S-K (items 101, 103 and 303), SAB 92, and SFAS 5. Table 1 summarizes the twenty-nine environmental GAAP disclosure items that form the basis for our index. Firm 10K reports are examined for the presence or absence of specific statements as outlined in the Table 1. Two reviewers (the author and a research assistant) evaluate each 10K report independently. The reviewers met routinely to discuss independent evaluations and resolve interpretive issues. The following procedures are performed for each sample firm in each year from 1991-1997 in developing the disclosure index:

1. A score of 1 is given for each disclosure item presented in the 10K (based on the listing of disclosure items in Table 1). Thus, the environmental disclosure score ranges from 0 (for no disclosure) to a maximum of 10 for years 1991 and 1992 (prior to SAB 92), and from 0 to 29 for years 1993-1997 (including disclosures required by SAB 92).

2. The environmental disclosure score is divided by the total number of environmental disclosure index items for each year, 10 for years 1991 and 1992, and 29 for years 1993-1997. The firms' final score for each sample year represents the percentage of GAAP environmental disclosures present out of the total possible. Thus, the index variable (ENVGAAP) equally weights the disclosure items.

Experimental Variables for Environmental GAAP Model

The primary experimental variable is return on assets (ROA), a measure of the firm's profitability. The level of profitability, for a given communication strategy, can provide managers with different incentives to influence impressions through disclosure. Without knowing whether a confirmatory or non-confirmatory communication strategy is in place, we simply predict that this variable will be significantly associated with environmental GAAP (see hypothesis H1).

After controlling for communication strategy, we expect ROA to be positively associated with environmental GAAP under a confirmatory strategy (hypotheses H2), and negative under a non-confirmatory strategy (hypotheses H3). Our confirmatory variable, CONFIRM, is used as an interaction variable to test whether ROA has a different coefficient under a confirmatory versus non-confirmatory disclosure strategy. CONFIRM is constructed by examining the coding of item number 2 in our disclosure index (see Item 2 in Table 1). The coding of item 2 indicates whether a disclosure for estimated environmental capital expenditures was made under SEC Regulation S-K (Item 101). We code CONFIRM equal to one when the firm makes this disclosure and the firm's ROA is less than the mean of the sample. Constructing CONFIRM in this fashion is consistent with the proposition by Neu et al. (1998) and Herremans, Akathaporn, and McInnes (1993) who state that a confirmatory disclosure is one where "in periods of relative unprofitability these same disclosures might be directed at convincing financial stakeholders that current environmental investments will result in a future competitive advantage and future profits." Thus, we have essentially identified firms whose profits are lower than average, but are profitable none-the-less, and yet, are still willing to make environmental investments for the future. This sample cut results in partitions that are reasonably balanced between above- and below-average profitability. The resulting partitions contain a significant number of firms making the environmental capital expenditure disclosure under Regulation S-K, Item 101, as follows: 307 firms in the partition where ROA is greater than the sample mean, and 245 firms in the partition where ROA is less than the sample mean. A sensitivity analysis using these sub-samples is discussed performed later in the paper. An important assumption for the validity of our CONFIRM proxy is that disclosure about environmental capital expenditures during times of lower profitability is a leading indicator that the firm's overall disclosure framework is a confirmatory one, signifying that profitability and environmental responsibility are not a trade-off, and therefore, are compatible corporate objectives. For econometric purposes, we eliminate this item from our environmental disclosure index when using the CONFIRM as an explanatory variable, and rename the environmental disclosure index as ENVGAAPx2. Specifically, we exclude item 2 from our original disclosure index (ENVGAAP) so that it is now based on a count of 28 possible GAAP disclosures instead of the initial 29 possible. This is to avoid inducing an algebraic bias in the regression by conditioning the right-hand-side variables on the basis of the dependent variable. Excluding Item 2 from the dependent variable insures the dependent variable and the independent variables are not measuring the same construct.

Table 1: Components of the Environmental Disclosure Index (ENVGAAP		
Item #	Source	GAAP Disclosures
1	Reg. S-K Item 101	A general description of the business and specific disclosure of the effects that compliance with environmental laws, when material.
2	Reg. S-K Item 101	Estimated amount disclosed for capital expenditures representing current and succeeding fiscal years in which those expenditures may be material.
3	Reg. S-K Item 103	Disclosure of pending or contemplated administrative or judicial proceedings.
4	Reg. S-K Item 103	Disclosure of material events and uncertainties known to management that would cause reported financial information to be unrepresentative of future operating results.
5	SFAS5	Nature of accrual.
6	SFAS5	Accrued amount
7	SFAS5	Nature of loss contingency
8	SFAS5	Estimate of additional possible loss or range.
9	SAFS5	Statement that estimate cannot be made.
10	SAFS5	Nature of probable unasserted claims that are possibly unfavorable.
11	SAB92	Whether an asset is recorded for probable recovery.
12	SAB92	Whether the accrual is undiscounted.
13	SAB92	The discount rate used.
14	SAB92	Expected payments for each of 5 succeeding years
15	SAB91	Reconciliation of the undiscounted to recognized amounts
16	ASB92	Material changes in expectation explained
17	SAB92	Circumstances affecting the reliability and precision of loss estimates
18	SAB92	Extent to which unasserted claims are reflected in any accrual or may affect th magnitude of the contingency
19	SAB92	Uncertainties with respect to joint and several liability
20	SAB92	Nature and terms of cost sharing arrangement with other PRPs
21	SAB92	Uncertainties with respect to insurance claims
22	SAB92	The extent to which disclosed but unrecognized contingent losses are expected to be recoverable through insurance, etc.
23	SAB92	Uncertainties about the legal sufficiency of insurance claims or solvency of insurance carriers.
24	SAB92	The time frame over which accrued or unrecognized amounts may be paid out
25	SAB92	Material components of accruals and significant assumptions.

Table 1: Components of the Environmental Disclosure Index (ENVGAAP		
Item #	Source	GAAP Disclosures
26	SAB92	Recurring costs associated with managing hazardous substances and pollution in ongoing operations
27	SAB92	Mandated expenditures to remediate previously contaminated sites.
28	SAB92	Other infrequent or nonrecurring cleanup expenditures, anticipated but not required in the present circumstances.
29	SAB92	Loss disclosure with respect to particular environmental sites that are individually material.

To test hypotheses H2 and H3, we examine the significance and sign of the coefficients on the interaction term, ROA*CONFIRM, and the main effect, ROA. A finding in support of H2 would mean the coefficient on ROA*CONFIRM and the coefficient on ROA would sum up to a positive number, and a finding in support of H3 would mean the coefficient on ROA is negative.

Control Variables for Environmental GAAP Model

Watts and Zimmerman (1978) suggest an association between company size and social responsibility disclosure. We use the total assets to proxy for SIZE, which is logged for regression testing purposes.

We use dummy variables to identify firms in the five industries included in the Counsel on Economic Priorities (CEP) studies (CHEM, OIL, PAPER, STEEL, POWER). The CEP identified these five industries as generating significant environmental hazards. Many companies within these five industries are also voluntarily involved with the "Responsible Care" initiative started by the chemical industry. The mission of "Responsible Care" is to go above and beyond government regulations and openly communicate with the public. Part of this initiative is to track performance using standard environmental, health, safety and security measures. Therefore, for reasons identified by the CEP or the "Responsible Care" initiative, we expect that companies in these industries to disclose more than companies in other industries.

Proxies in previous research for regulatory influence or pressure include an estimated average environmental liability per PRP (Barth and McNichols, 1994) or the number of PRP sites identified per firm (Stanny, 1998). Alciatore et al. show that remediation liability, the central focus in most studies, is just one subset of the total environmental costs. Environmental exit costs are another subset of costs, and indeed can be much larger than the remediation costs. To capture the regulatory influence or pressure related to all environmental costs, we include both the estimated average environmental liability (ENVLIAB) and the number of PRP sites identified per firm (SITES). The two proxies together are likely to capture more of the components of regulatory pressure or rules pertaining to environmental disclosure than either of the proxies on an individual basis. We expect estimated liabilities (ENVLIAB) and the number of sites per PRP (SITES) to be positively associated with increased disclosure.

The environmental liability (ENVLIAB) is based on information provided in the ROD, which provides estimated costs of cleanup for Superfund sites. The ROD is obtained from the Superfund Public Information System (SPIS), which contains the full-text of the official ROD documents signed and issued by

EPA from Fiscal Years 1982-1997. The following procedures are used to calculate the average liability, ENVLIAB:

3. The Superfund PRP Listing from the EPA is used to identify the number of sites to which each sample firm is named as of 12/31/1997.
4. The SPIS database is used to obtain the RODs for all sites to which sample firms are named as of 1997. The ROD is examined for each site to obtain the Present Worth Cost (PWC), which represents the present value of the estimated clean up costs for the site.
5. For each site, the total number of PRPs is determined by sorting the Superfund PRP Listing by site number.
6. The number of publicly traded PRPs for each site is obtained using the EDGAR database, and is used to compute an average liability for each site. The average liability is calculated by dividing the PWC by the number of publicly traded PRPs for each site, which indicates the potential for shared responsibility for cleanup.
7. The average liability for each site to which a sample firm is named is then added to obtain a total average liability. The current study uses total average liability as a proxy for potential environmental liability.

After 1992, the number of total, mandated disclosures possible increased from 10 to 29 with the introduction of SAB 92. We include a 1:0 indicator variable, POSTSAB92, to control for this effect.

Since our CONFIRM variable is an identifier based on disclosure about estimated environmental investment, we control for capital expenditures to separately identify the related confirmatory effects of disclosure. Therefore, we include CAPX in the regression, which is total capital expenditures scaled by total assets.

Market Model

The general form of our market model is:

Market Returns = ƒ (Firm-Specific Characteristics, Industry Related Characteristics, and Environmental Disclosure).

Substituting empirical proxies, we use the following regression model to test our hypotheses related to the valuation effects of environmental GAAP.

$$RETURN = \beta_0 + \beta_1 MKBK + \beta_2 CHEM + b_3 OIL + \beta_4 PAPER + \beta_5 STEEL + \beta_6 POWER + \beta_7 ENVLIAB + \beta_8 POSTSAB92 + \beta_9 ROS + \beta_{10} UE + \beta_{11} CAPX + \beta_{11} ENVGAAP + \varepsilon.$$

Dependent Variable for the Market Model

RETURN is an industry-adjusted annual return. We calculate RETURN as the 12-month change in stock price ending 3 months after the fiscal year end (adjusted for dividends), scaled by the stock price at the

beginning of this 12-month window. This staggered return window is intended to capture the disclosure effects of the 10-K report, which is typically released about 3 months after the fiscal year end.

Experimental Variables for the Market Model

To assess hypothesis H4, we examine the significance of the coefficient on ENVGAAP, regardless of sign. To examine hypotheses H5 and H6, we examine the significance and sign of the coefficients on the interaction term, ENVGAAPx2*CONFIRM, and the main effect, ENVGAAPx2 (as noted before, ENVGAAPx2 is the disclosure index, ENVGAAP, excluding Item 2). A finding in support of H5 would mean the coefficient on ENVGAAPx2*CONFIRM and the coefficient on ENVGAAPx2 would sum up to a positive number, and a finding in support of H6 would mean the coefficient on ENVGAAPx2 is negative.

Control Variables for Environmental GAAP Model

MKBK is the ratio of market value of equity to the book value of equity and is a proxy for future growth opportunities. We expect a positive relation between MKBK and returns. We include control variables for the industries identified by the CEP as particularly hazardous (CHEM, OIL, PAPER, STEEL, POWER) in the event the excess industry-adjusted returns are systematically different for these industries.

POSTSAB92, an indicator variable controls for the SEC's environmental disclosures added in 1992; and ROS, return-on-sales, is included as a proxy for the impact of a firm's cost control on firm value (Al-Tuwaijri et al. 2004).

In the market model we use ENVLIAB as a control for environmental exposure. Various proxies have been used for this construct in previous research (Al-Tuwaijri et al. 2004), which controls for pollution intensity. We expect this variable to be negatively related to returns since future environmental costs should reduce the market value of the firm.

To control unexpected returns due to unexpected earnings, we include UE, a metric based on the annual change in earnings-per-share divided by the stock price at the beginning of the period. The positive association between earnings and returns is well documented in the accounting literature. We also include a capital expenditure variable, CAPX, to control for the future economic benefits from capitalized assets. CAPX is the current period reported capital expenditures scaled by total assets and should be positively associated with returns (Clarkson, Li, and Richardson 2004).

Sample Selection

Table 2 provides information about our sample selection process. Our goal is to identify a sample of big firms with a known PRP association and, therefore, a high probability of using environmental GAAP. We identified 245 Fortune 500 firms that are named as a PRP on the SPIS database. We then eliminated financial and business services firms (23), firms that had no ROD issued (27), firms that were not publicly traded during the entire sample period (11), and firms that were added as a PRP during the sample period (13). For the 171 firms in our final sample we obtained 1,187 firm-year observations with complete data for regression testing (10 firm-year observations had missing data).

Table 2: Sample Selection Procedures	
Selection criteria	No. of Firms
1997 Fortune 500 firms named as PRP on SPIS database	245
Firms eliminated:	
Financial and Business Services	(23)
Firms named to a site with no ROD issued	(27)
Firms not publicly traded during entire sample period	(11)
Firms added as PRP during the sample period	(13)
Final sample of firms for analyses	171
No. of Firm-Year Observations	
Total firm-year observations possible (171 firms x 7 years)	1197
Observations with missing data	(10)
Final sample of firm-year observations	1187

RESULTS

Descriptive Statistics

The sample firms represent a broad cross-section of industries. Table 3 shows that 13 primary industries are represented at the general 2-digit SIC industry classification level. Industries that contain fewer than 10 firm-year observations are not explicitly listed. At the 4-digit SIC classification level, there are 33 industries represented. The five industries identified by the Counsel on Economic Priorities as generating significant environmental hazards, namely, oil, chemicals, power, paper, and steel, represent a combined total of 36.0 percent of the firm-year observations. The machinery industry has the largest representation with 27.6 percent of the sample.

Table 3: Industry Distribution of Sample Observations		
Industry	No. Of Observations	% of Sample
Oil	79	6.7
Chemicals	139	11.7
Power	76	6.4
Paper	63	5.3
Steel	70	5.9
Food	80	6.7
Wood	28	2.4
Printing	28	2.4

Table 3: Industry Distribution of Sample Observations		
Industry	No. Of Observations	% of Sample
Plastic, Glass & Cementt	42	3.5
Machinery	328	27.6
Transportation	70	5.9
Wholesale	21	1.8
Retail	69	5.8
All Other (observations ≤10 per industry	94	7.9
Total Observations	1187	100

Descriptive statistics for model variables are summarized at Table 4. The mean SIZE of sample firms, measured by total assets, is $14,208 million and the mean ROA is 4.6%. As expected, the sample firms are large with positive profits since they are drawn from the Fortune 500. However, the mean industry-adjusted market (RETURN) is negative, possibly reflecting the lower performance of larger companies during this period. Unadjusted market returns (RAWRETURN) for the sample are positive overall, with a mean and median of 19.4% and 16.6%, respectively. Consistent with the ROA statistics, the overall raw market return is positive.

Table 4
Descriptive Statistics for 1,187 observations from 1991 to 1997

Variable	Mean[1]	Std Dev	Median
ENVGAAP (proportion)	0.35	0.23	0.34
ENVGAAPx2 (proportion)	0.38	0.32	0.33
RETURN (percentage)	-10.3	66.7	-3.5
RAWRETURN (percentage)	19.4	30.6	16.6
SIZE ($ millions)	14,208	30,069	6100
ROA (percentage)	4.6	5.6	4.5
ROS (percentage)	4.7	7.6	4.3
UE (proportion)	0.04	3.57	0.01
MKBK (ratio)	2.9	6.2	2.4
CAPX ($ millions)	947	1,966	398
ENVLIAB ($ millions)	17.1	28.6	6.0
SITES (number of PRP sites per firm)	17.2	19.3	10.0
POSTSAB92 (1:0 indicator for SAB 92 rules or not)	0.73	0.44	1.00
CONFIRM (1:0 indicator for confirmatory disclosure or not)	0.26	0.44	0.00

[1]t-statistics for all means are significant at $p \leq 0.01$, except for UE ($p = 0.70$).

Variable definitions:
ENVGAAP = a count of environmental GAAP disclosures actually made as a proportion of total possible (source: 10k).
ENVGAAPx2 = same as ENVGAAP except it excludes disclosure item 101 under regulation S-K (which disclosure #2 listed in Table 1).
RETURN = an industry-adjusted annual return calculated as the 12-month change in stock price ending 3 months after the fiscal year end (adjusted for dividends), scaled by the stock price at the beginning of this 12-month window (source: Compustat).
RAWRETURN = same as RETURN above except not adjusted for industry mean return.
SIZE = total assets (source: Compustat).
ROA = income before extraordinary items divided by total assets (source: Compustat).
ROS = net income divided by total sales revenue. (source: Compustat).
UE = annual change earnings-per-share divided by beginning stock price (source: Compustat).
MKBK = market value equity divided by book value equity (source: Compustat).
CAPX = total capital expenditures for the period (source: Compustat).
ENVLIAB = estimated average environmental liability per PRP. (Source: Environmental Protection Agency's Records of Decision).
SITES = number of superfund sites associated with a PRP. (Source: provided by a representative at the Environmental Protection Agency.
POSTSAB92 = 1 for SAB environmental disclosures made after 1992, and 0 otherwise.
CONFIRM = 1 CONFIRM is constructed by examining the coding of item number 2 in our disclosure index (see Item 2 in Table 1). The coding of item 2 indicates whether a disclosure for estimated environmental capital expenditures was made under SEC Regulation S-K (Item 101). We code CONFIRM equal to one when the firm makes a disclosure about future environmental capital expenditures and the firm's ROA is less than the mean of the sample, 0 otherwise.

The mean estimated environmental liability, ENVLIAB, is $17.2 million, which is a small percentage of the total assets of the sample firms. None of the sample firms have an estimated liability that exceeds 5% of total debt, the materiality threshold for mandatory accrual under 10k reporting requirements of the SEC. The mean number of PRP sites (SITES) per sample firm is 17.1, which is higher relative to previous research (Stanny 1998), however, our sample is taken from a later period, a time when more PRPs have been identified, and is drawn from a set of firms that are typically larger with greater output than the average firm in Compustat. The mean for POSTSAB92 is 0.73, indicating a large proportion of the sample observations occur subsequent to the implementation of SAB 92. ENVGAAP, the proportion of environmental GAAP disclosures made, has a mean of 0.35.

The mean for CONFIRM is 0.26, indicating that roughly one-fourth of the sample is making a leading, confirmatory disclosure about future environmental capital expenditures even though profits for these firms are less than the mean of the sample. The mean unexpected return (UE) is 0.04, which is consistent with previous research; however, the mean is not statistically different from zero. The median UE is 0.01 and is statistically different from zero based on a rank sum test. All other means are statistically different from zero. The means for return-on-sales (ROS), market-to-book equity (MKBK), and capital expenditures (CAPX) are 4.7%, 2.9, and $947M, respectively, and are consistent with previous research.

Tables 5 and 6 provide a graphical representation of the environmental GAAP disclosures over the sample period. In Table 5, the total number of environmental GAAP disclosures possible for the sample firms increases after 1992 from 1,710 (171 sample firms x 10 mandatory disclosures possible) to 4,959 (171 sample firms x 29 mandatory disclosures possible) while the actual number of environmental GAAP disclosures after 1992 increases from 868 to 1449. On a per firm basis, total possible disclosures increases from 10 to 29 in 1993, a 190 percent increase, while the average number of actual disclosures increases from 5.1 to 8.4, a 65 percent increase. From 1994 to 1997, the change in actual disclosures made appears to level off as the percentage increase is only 0.06 percent per year. Of course, we do not know if the firms are under-reporting with respect to the environmental GAAP disclosures since we cannot verify whether the underlying event has actually occurred. However, we note that the increase in actual mandated disclosures is not commensurate with the increase in total possible mandated disclosures, and that the gap between the two remains fairly constant after 1993.

Table 6 shows that starting in 1993 PRPs were making 3 out 4 Regulation S-K disclosures, and under SFAS 5 were making 2.7 out of the 6 mandatory disclosures possible. In terms of the average number of total environmental GAAP disclosures possible over the entire time frame, PRPs were making about 51% of the possible disclosures required under Regulation S-K and SFAS 5 (pre-1993), which then dropped off to about 29% at the time that the requirements for the additional SAB 92 disclosures were implemented. The proportionate drop is a result of an increasing denominator, however, the percentage of total disclosures made has leveled off at around 30% through 1997. Thus, the increase in actual disclosures made is apparently not commensurate with the increase in total environmental GAAP disclosures possible, which may hold implications about compliance or the pertinence (i.e., applicability) of the new disclosures required after 1992.

Table 5

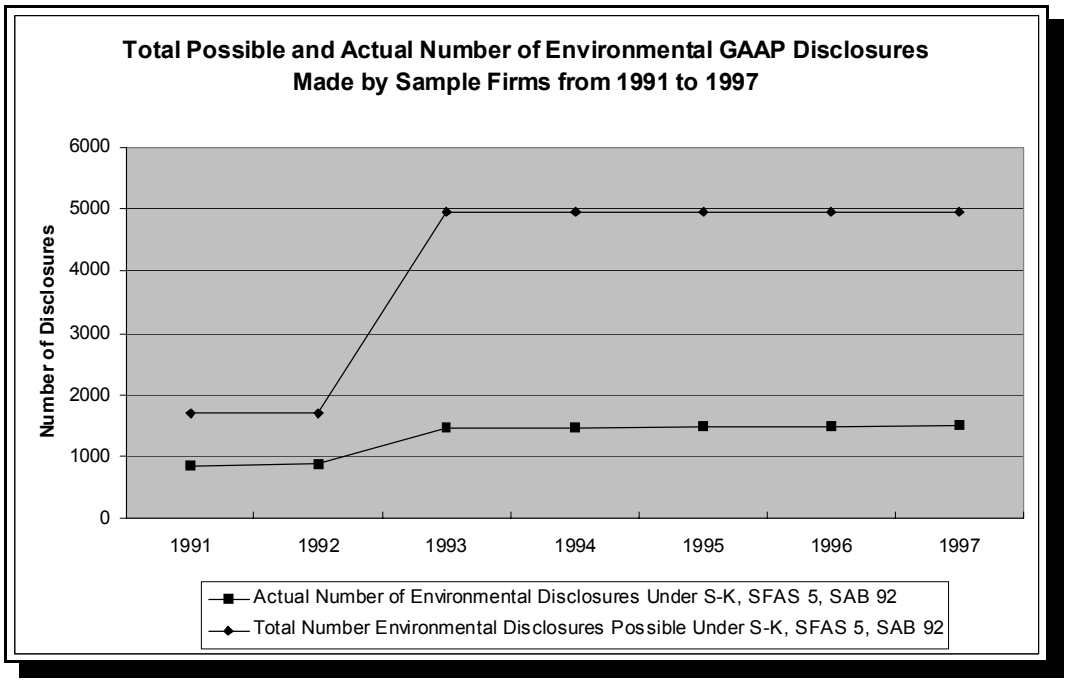
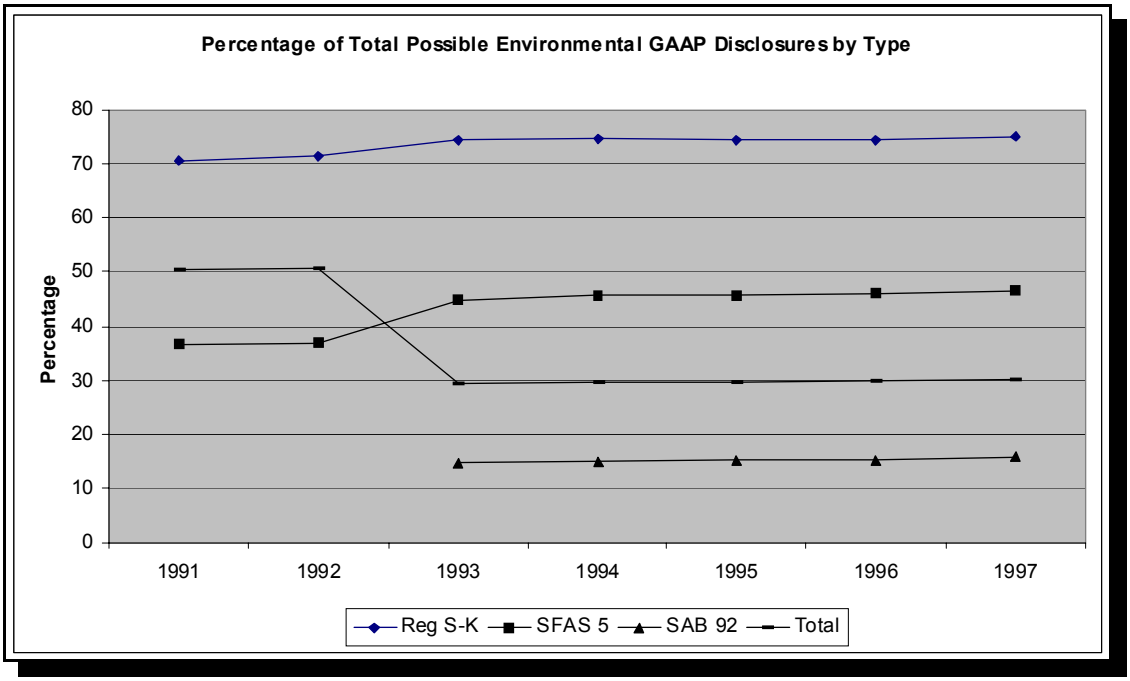


Table 6



Regressions

Table 7 reports the regression results for our environmental GAAP model related to hypothesis H1. The overall explanatory power of model is significant. The adjusted R-square is about 54.8%, and F-statistic for the model is 132.09. The coefficients on the control variables are all significant in the expected direction. The coefficients on ENVLIAB and SITES are positive and significant, consistent with the regulatory influence hypothesis, and the coefficient on POSTSAB92 is negative and significant indicating the proportion of environmental GAAP disclosures made after the implementation of SAB 92 decreased significantly. Consistent with hypothesis H1 about profits, the coefficient on the experimental variable, ROA is significant at $p < .01$ suggesting it is an important determinant of the level of environmental GAAP disclosures provide by the firm. The sign of the association is negative, which is consistent with previous research by Al-Tuwaijri et al. (2004) and Neu et al. (1998), indicating that the level of environmental GAAP disclosed increases as profitability deteriorates.

Table 7
Environmental GAAP Disclosure Model Regression Results.
The Dependent Variable is a disclosure index (ENVGAAP).

(1) Variables	(2) Predicted Sign	(3) Coefficients
		N = 1187
INTERCEPT		0.247[c] (5.82)
ln(SIZE)	-2	0.034[c] (6.83)
CHEM	0	0.159[c] (10.40)
OIL	0	0.197[c] (10.45)
PAPER	0	0.130[c] (6.21)
STEEL	0	0.204[c] (10.34)
POWER	0	0.260[c] (13.66)
ENVLIAB	0	0.021[c] (8.47)
SITES	0	0.003[c] (8.83)
POSTSAB92	-	-0.204[c] (-19.69)
CAPX	0	0.053[c] (4.82)
ROA	-/+	-0.004[c] (-4.79)
Adjusted R^2		0.548
F-Value		132.09

The total number of observations used is 1,187 and the sample period is 1991 through 1997. Variables defined in Table 4. Superscripts [a], [b], and [c], indicate one-tail statistical significance at 0.10, 0.05, and 0.01 levels, respectively.

Table 8 reports the regression results for an environmental GAAP model with the primary purpose of comparing the coefficients on ROA in the "confirmatory" and "non-confirmatory" partitions of the sample. The adjusted R-square is 58 percent, the F-statistic for the model is significant, and the sign and t-statistics for all controls variables are significant and in the expected direction. The coefficient on ROA is negative and significant at the 0.01 level. This is a baseline coefficient and represents the slope for ROA when CONFIRM = 0, the non-confirmatory partition. The negative sign is consistent with hypothesis H3, suggesting that managers that cannot confirm the concurrent objectives of profitability and environmental responsibility choose to disclose less about environmental activities. The coefficient on ROA*CONFIRM, as a differential coefficient, is positive and significant indicating the slope coefficient on ROA when CONFIRM = 1 is statistically larger than the slope coefficient on ROA when CONFIRM = 0. Adding the coefficient on ROA to the coefficient on ROA*CONFIRM provides an estimate of the magnitude of the slope coefficient on ROA when CONFIRM = 1. This estimate is positive overall (coefficients from Table 8: -0.003 + 0.007 = 0.004), which is consistent with hypothesis H2.

Table 8
Environmental GAAP Disclosure Model Regression Results.
The Dependent Variable is a disclosure index (ENVGAAPx2).

(1) Variables	(2) Predicted Sign	(3) Coefficients
		n = 1187
INTERCEPT		0.352[c] (6.30)
ln(SIZE)	-2	0.033[c] (5.08)
CHEM	0	0.148[c] (7.08)
OIL	0	0.217[c] (8.54)
PAPER	0	0.091[c] (3.24)
STEEL	0	0.211[c] (7.48)
POWER	0	0.255[c] (9.60)
ENVLIAB	0	0.018[c] (5.56)
SITES	0	0.003[c] (8.03)
POSTSAB92	-	-0.366[c] (-26.80)
CAPX	0	0.047[c] (3.18)
ROA	-/+	-0.003[c] (-2.52)
CONFIRM	0	0.103[c] (5.38)
ROA*CONFIRM	0	0.007[a] (1.49)
Adjusted R^2		0.580
F-Value		125.93

The total number of observations used is 1,187 and the sample period is 1991 through 1997. Variables defined in Table 4. Superscripts [a], [b], and [c], indicate one-tail statistical significance at 0.10, 0.05, and 0.01 levels, respectively. [1]CONFIRM is interacted with ROA to estimate the differential coefficient on ROA when the disclosures are of a confirmatory nature. When CONFIRM=1, the observation is considered to be of a confirmatory nature, non-confirmatory otherwise. CONFIRM is assigned a value of 1 when a firm makes a disclosure about future environmental expenditures under Regulation S-K, Item 101, and the firm has an ROA less than the mean of the sample.

In sum, the environmental GAAP model results presented in Tables 7 and 8 suggest there is a differential effect of profits on environmental disclosure for a given disclosure framework. Under a confirmatory framework, managers are providing more environmental GAAP disclosures to persuade constituents that profits are not at the expense of the environment. Under a non-confirmatory framework, managers have not committed to future environmental investment, and therefore, do not make disclosures that profitability and environmental investment are compatible goals for the future. A related implication is that managers prefer to disclose less or remain silent about environmental issues as profitability increases (under a non-confirmatory orientation).

In Table 9 we report the regression results of a market model that is intended to test if ENVGAAP is significant in explaining market returns. The adjusted R-square is 7.6 percent, the F-statistic is 8.20 (significant at the 0.01 level), and most of the control variables are significant in the expected direction. Consistent with hypothesis H4, the coefficient on ENVGAAP is significant at the 0.10 level, suggesting that environmental GAAP disclosures are an important determinant of market returns. The negative sign on ENVGAAP is consistent with previous studies suggesting environmental GAAP disclosures are associated with lower market returns (Al-Tuwaijri et al. 2004 and Neu et al. 1998).

Table 9
Market Model Regression Results.
The Dependent Variable is Industry-Adjusted Market Returns (RETURN).

(1) Variables	(2) Predicted Sign	(3) Coefficients
		N = 1187
INTERCEPT		-0.154[c] (-3.00)
MKBK	-2	0.005[c] (2.56)
CHEM	-/+	-0.001 (-0.03)
OIL	-/+	-0.112[c] (-2.80)
PAPER	-/+	0.041 (1.06)
STEEL	-/+	0.019 (0.50)
POWER	-/+	0.080[b] (2.11)
ENVLIAB	-	-0.006[a] (-1.38)
POSTSAB92	-/+	0.056[c] (2.47)
ROS	0	0.497[c] (3.07)
UE	0	0.168[c] (2.61)
CAPX	0	0.046[b] (2.10)
ENVGAAP	-/+	-0.074[a] (-1.43)
Adjusted R^2		0.076
F-Value		8.20

The total number of observations used is 1,187 and the sample period is 1991 through 1997. Variables defined in Table 4. Superscripts [a], [b], and [c], indicate one-tail statistical significance at 0.10, 0.05, and 0.01 levels, respectively.

In Table 10, the coefficient on ENVGAAPx2 is negative and significant at the 0.05 level. In an analysis similar to that presented previously with the environmental GAAP disclosure model, the coefficient on ENVGAAPx2 is a baseline coefficient and represents the slope for ENVGAAPx2 when CONFIRM = 0, the non-confirmatory partition. The significant negative sign is consistent with hypothesis H6, suggesting investors penalize stock price when environmental disclosures are made that are not confirmatory. The coefficient on ENVGAAPx2*CONFIRM, as a differential coefficient, is positive and significant indicating the slope coefficient on ENVGAAPx2 when CONFIRM = 1 is statistically larger than the slope coefficient on ENVGAAPx2 when CONFIRM = 0. Adding the coefficient on ENVGAAPx2 to the coefficient on ENVGAAPx2*CONFIRM provides an estimate of the magnitude of the slope coefficient on ENVGAAPx2 when CONFIRM = 1. This estimate is negative overall (coefficients from Table 10: -0.108 + 0.094 = -0.014), which is not consistent with hypothesis H5.

Table 10
Market Model Regression Results.
The Dependent Variable is Industry-Adjusted Market Returns (RETURN).

(1) Variables	(2) Predicted Sign	(3) Coefficients
		N = 1187
INTERCEPT		-0.147[c] (-2.91)
MKBK	-2	0.005[c] (2.55)
CHEM	-/+	0.001 (0.03)
OIL	-/+	-0.111[c] (-2.79)
PAPER	-/+	0.053[a] (1.37)
STEEL	-/+	0.007 (0.19)
POWER	-/+	0.077[b] (1.98)
ENVLIAB	-	-0.007[a] (-1.63)
POSTSAB92	-/+	0.047[b] (1.88)
ROS	0	0.530[c] (3.17)
UE	0	0.161[c] (2.49)
CAPX	0	0.045[b] (2.03)
ENVGAAPx2	-/+	-0.108[b] (-2.25)
CONFIRM	0	-0.032 (-0.81)
ENVGAAPx2*CONFIRM	0	0.094[a] (1.44)
Adjusted R^2		0.077
F-Value		7.25

The total number of observations used is 1,187 and the sample period is 1991 through 1997. Variables defined in Table 4. Superscripts [a], [b], and [c], indicate one-tail statistical significance at 0.10, 0.05, and 0.01 levels, respectively. [1]CONFIRM is interacted with ENVGAAPx2 to estimate the differential coefficient on ENVGAAPx2 when the disclosures are of a confirmatory nature.

In sum, the market model results presented in Tables 9 and 10 suggest there is a differential effect of environmental GAAP disclosure on stock returns for a given disclosure framework, but only to the extent that it mitigates negative valuation effects. Under a non-confirmatory framework, investors penalize stock price for lower levels of environmental GAAP disclosures; under a confirmatory framework, investors penalize the stock price to a lesser extent. The confirmatory disclosure framework minimizes the magnitude of the negative effect of environmental GAAP disclosures on stock price.

ROBUSTNESS CHECKS

Regression Diagnostics

We run a number of regression diagnostics to test the robustness of our results. The current estimates are reported under the assumptions of ordinary least squares and it is possible that the SIZE and ENVLIAB variables may create a heteroscedasticity problem. Therefore we run the regressions with White's (1980) robust estimator and get results that are qualitatively the same as those presented. The Durbin-Watson statistic does not indicate the presence of significant autocorrelation, however, as a sensitivity we also control for the effects of time by including a dummy variable for each year. These results are identical to the results presented, which include a dummy variable for the time period after SAB 92 implementation. Finally, multicollinearity does not appear to be an issue since all variance inflation factors are less than 2.2, and the reported findings are insensitive to influential observations as identified by Belsley, Kuh, and Welsch (1980) diagnostics.

Sensitivities for capital expenditures

Although we control for the effects of total capital expenditures, which includes environmental capital expenditures, as an additional measure of control for capital expenditures we eliminate all observations from the non-confirmatory partition that do not report an environmental GAAP disclosure under Regulation S-K, Item 101, an estimate for future environmental capital expenditures (see item # 2, Table 1). After this sample screen, the non-confirmatory and confirmatory partitions contain only those firms that disclose an estimate for current and future environmental capital expenditures. This results in 245 observations in the non-confirmatory partition and 307 observations in the confirmatory partition. Using these 552 observations, the regression results (not presented) for the environmental GAAP disclosure model are qualitatively the same as those reported in Table 8: the coefficient on ROA is negative and significant (estimate = -0.011, t-statistic = -3.52, p-value < 0.01), and the coefficient on the interaction term, ROA*CONFIRM, is positive and significant (estimate = 0.014, t-statistic = 2.75, p-value < 0.01). Adding the baseline coefficient on ROA (which represents the slope in the non-confirmatory partition) to the differential coefficient on ROA*CONFIRM provides an estimate of the total coefficient on ROA in the confirmatory partition (-0.011 + 0.014 = 0.003). Thus, the estimated coefficient on ROA in the non-confirmatory partition versus the confirmatory partition is -0.011 versus 0.003, respectively. The sign and significance of these estimates supports hypotheses H2 and H3.

We use the same 552 observations for a sensitivity analysis on capital expenditures in the market model. In terms of hypotheses H6, the regression sensitivity result (not presented) is qualitatively better than

that reported in Table 9: the coefficient on ENVGAAPx2 is negative, but not significant (estimate = -0.061, t-statistic = -0.60, p-value = 0.27), however, the coefficient on the interaction term, ENVGAAPx2*CONFIRM, is positive and marginally significant (estimate = 0.130, t-statistic = 1.35, p-value = 0.08). Adding the baseline coefficient on ENVGAAPx2 (which represents the slope in non-confirmatory partition) to the differential coefficient on ENVGAAPx2*CONFIRM provides an estimate of the total coefficient on ROA in the confirmatory partition which is positive (-0.061 + 0.130 = 0.069). Thus, the estimated coefficient on ENVGAAPx2 in the non-confirmatory versus the confirmatory partition is -0.061 versus 0.069, respectively. Although there is no significant evidence in support of H5, there is significant evidence in support of H6.

Sensitivity for Industry Effects

Including the dummy variables for the five industries identified by the CEP increases the adjusted R-square by approximately 16 percentage points for the environmental GAAP model, but only 1 percentage point for the market model. Outside of the five CEP industries, the industry distribution statistics show that the Machinery industry is the largest industry group, followed by Food and Transportation. Sensitivities that include dummies for these industries do not improve or change the explanatory power of the regressions, and so it appears that the industries identified by the CEP are the ones making the additional environmental GAAP disclosures.

Sensitivity for Self-Insurance Disclosure

In constructing ENVGAAP, our implicit assumption is that a higher score represents a higher level of disclosure. However, the disclosure items related to insurance may not represent a meaningful disclosure. Many large firms self-insure, and in some cases a firm's insurance may not cover contingent liabilities. Thus, it is not clear that a lack of disclosure relative to the insurance items is necessarily a deficiency in disclosure. To examine if these insurance items have an impact on our results, we construct the variable ENVGAAPx21_24 by eliminating disclosure items 21 through 24 from the index and rerun the empirical tests. The results are not qualitatively different.

Sensitivity for Estimated Environmental Liability

A potential model specification issue is related to the fact that our liability estimate is an average and is not weighted toward those PRPs that are likely to have a larger portion of the liability on each site. Thus, the negative sign on our profitability proxy (ROA) could be a consequence of bigger firms having bigger liabilities that tend to disclose more, and therefore, lower profitability because they have to accrue more. Prior research has shown that the chemical industry has a relatively large number of PRPs identified that are associated with a large number of sites suggesting PRPs in the chemical industry are more likely to pay (Campbell, Sefcik, and Soderstrom 2003). As a sensitivity we interact ROA with the chemical industry dummy to determine if a differential coefficient on ROA exists for the chemical industry. The estimated coefficient on the interaction term is insignificant suggesting the coefficient on ROA in the chemical industry is no different than the rest of the cross-section.

CONCLUSION

Our study contributes to the understanding of environmental disclosure practices of publicly traded U.S. firms by examining the factors associated with the extent of environmental GAAP disclosures, as well as the valuation effects of the environmental GAAP disclosures in 10K filings. Identifying factors that are systematically related to environmental disclosure helps regulators, investors, and other users of 10k information to be on guard in reading the financial information where the model predicts a potential lack of disclosure. Consistent with previous research, our findings indicate that profitability is significantly associated with environmental GAAP disclosures, and these same disclosures are value-relevant to investors. We also find that the effect of profitability on the level of environmental GAAP disclosed is contingent on how the disclosures are framed. A confirmatory disclosure framework indicates the manager's credible intent to simultaneously achieve financial success and environmental responsibility, as suggested by Porter and van der Linde (1995). In this scenario, the manager discloses more information about the added benefits of pursuing a joint strategy of higher financial performance and increasing environmental responsibility in the future. Under a non-confirmatory disclosure framework, the manager cannot or will not credibly indicate that simultaneous pursuit of profits and environmental responsibility is possible, and so he reduces his disclosures about environmental activities. Investors perceive differences in confirmatory versus non-confirmatory disclosures, mitigating the negative valuation impact of environmental GAAP disclosures under the confirmatory framework.

We also provide some striking descriptive evidence about a sample of firms that have been specifically identified as potentially responsible parties by the EPA. We find that the percentage of environmental GAAP disclosures actually made by these firms decreases from 51 percent to 29 percent at a time when the required disclosures for environmental liabilities virtually triples. Although the level of environmental disclosures may be appropriate, the drop in the rate of reporting environmental GAAP disclosures raises questions about the usefulness of the additional GAAP or the compliance rate by PRPs, both of which question the completeness of environmental disclosures.

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ARE NAICS INDUSTRIES MORE HOMOGENEOUS THAN SICS INDUSTRIES?

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ABSTRACT

This study compares the homogeneity of industry members when classified under the Standard Industry Classification System (SICS) and when classified under the North American Industry Classification System (NAICS). Homogeneity is measured as (1) correlations of operating expense changes and of revenue changes, and (2) the variability of inventory, debt, and depreciation policies among member firms. Firms are tracked from SICS-defined industries to NAICS-defined industries and three comparisons are made. First, NAICS CLEANED industries, whose SICS memberships have been weeded to produce a subset of fewer firms under the NAICS codes, are more homogenous than the original SICS industries. Second, NAICS INTACT industries, all of whose members have the same SICS and NAICS codes, are more homogenous than the SICS non-INTACT industries, whose member-firms have different NAICS codes. Lastly, NAICS CONSOLIDATED industries, whose memberships are formed from a wide variety of prior SICS industries, are not as homogenous as the prior SICS classifications. Our results help identify which types of NAICS-defined industries provide more homogenous groups for such inter-firm comparisons as ratio analysis and benchmarking.

INTRODUCTION

Industry groupings of companies have many applications in business. It is common to compare a firm's financial performance to an industry peer group. For instance, bankers often evaluate commercial loans by comparing applicant firms' financial statements to industry measures (http://www.eci-equity.com/rma_industry_comparisons.htm). Also, such benchmarking services as the Aberdeen Group (http://www.aberdeen.com/) and Enovation (http://www.enovation.com.au/) offer to evaluate how clients' performances measure up to their industry peers. Not only are companies interested in comparing themselves to similar companies, but their auditors also compare such client performance indicators as ratios to industry standards to help evaluate risk (e.g., Winograd, Gerson & Berlin, 2000). This extensive use of industry comparisons in practice is supported by research that concludes that financial statement comparisons are meaningful when made among like members of groups, such as industries (Lee, 1985). As a result, this study uses financial statement information to identify homogenous groupings of firms.

Two well-known industry classification schemes are the Standard Industry Classification System (SICS) and the North American Industry Classification System (NAICS). Morgan Stanley and Standard & Poor's have also developed a third scheme, the Global Industry Classification Standards. However, because many accounting firms' analyses are now based on NAICS industries instead of their prior SICS-based analyses, we restrict our study to comparing NAICS and SICS. The question asked in this study is: does

financial statement information suggest that NAICS groups are always more homogenous than SICS groups of firms?

SICS is a self-classification system that has been in use since the 1933 and 1934 SEC Acts. Although revisions have been made to the SICS classifications throughout the years, the original product/output orientation has remained, but has fostered the criticism that it does not reflect the changes to processes that characterize our economy (Fama & French, 1997; Krishnan & Press, 2002; Bhojraj, Lee & Oler, 2003).

NAICS is the second major classification scheme. In 1994, the Office of Management and Budget issued a notice of intent to change from SICS to NAICS as an official classification method (OMB, 1994) and the framework was released in 1996 (see http://www.census.gov/epcd/www/naicsdoc.htm). The NAICS categories are based on production processes, rather than product outputs. For example, tire retreading and repair shops are classified under services using SICS codes (7534), but are classified with manufacturing of rubber products using NAICS codes (326212). Firms that use different processes are classified under different NAICS codes, even though they produce the same product. For instance, SIC 3131 includes firms that manufacture boot soles and heels, but NAICS classifications differentiate between metal (339993) and wood (321999) heel manufacturers.

Because of the difference in the conceptual bases of SICS and NAICS, their application results in different firms being grouped together. Thus, if a firm's financial performance is compared to the performance of other members of that firm's industry, different comparisons could result, depending on which classification scheme is used. Accordingly, like Lee (1985) and Ezzamel, Mar-Molinero & Beecher (1987), we believe that firms' homogeneity will be evident in their financial statement similarities so we use accounting variables to measure industry-member homogeneity. The variables used are (1) change in operating expenses, (2) change in sales, and (3) accounting policies. The evidence presented in this paper suggests that types of NAICS classifications may offer improved financial statement homogeneity for some industry group members.

The next section motivates the research and develops the hypotheses. The third and fourth sections describe the sample selection procedures and the resulting sample data. The fifth section presents the results of the study while the last section contains conclusions.

BACKGROUND AND HYPOTHESES

One of the first to question the capability of SICS to form homogenous groups of companies was Clarke (1989). In this early study, the author evaluates whether increased refinement from one-digit SIC to four-digit SICS is able to better explain the variation in the change in sales (first differences) of associated firms. He reports that three- and four-digit SICS codes do not offer more descriptive ability than do the one- or two-digit classifications and concludes that SICS classifications are too weak for any meaningful economic analysis. We extend Clarke (1989) by examining whether firms in NAICS-based industries provide more homogenous measures of change in sales compared to firms in SICS-based industries.

Motivated by the significant amount of post-Clarke (1989) research that used SICS industry classifications, two recent studies have also examined industry classification schemes. Krishnan & Press (2003) compare SICS and NAICS classifications and report that financial ratio variances are lower in many five- or six-digit NAICS industries compared to four-digit SICS. They choose four common ratios: return on assets, current ratio, long term debt to assets, and sales to assets. They also examine intra-industry information

transfers between the stock prices of member firms and the earnings announcements of other firms in the same industry, when industry is defined alternatively by NAICS and by SICS. They report that the dispersion of the response coefficient on "other firms' earnings" is narrower in five of 16 NAICS industries compared to the dispersion under SICS classifications. Based on these two analyses, the authors conclude that many NAICS industries are more homogenous compared to SICS industries.

The second study, Bhojraj, Lee & Oler (2003), also compare NAICS and SICS industry classifications. These authors examine the ability of each of the classification schemes to predict monthly returns and to explain the variances of several financial ratios. In their tests, NAICS-based industry averages for both the returns and for each of the ratios are compared to SICS-based industry averages in their ability to predict individual firm measures. They report that the NAICS and SICS schemes do not significantly differ from each other, which is inconsistent with Krishnan & Press.

This study extends Krishnan & Press and Bhojraj, Lee & Oler on two fronts. First, these prior studies evaluate industry homogeneity using measures (ratios and prices) that result from accounting variables. We, however, employ financial statement data that are the fundamental inputs to ratios and prices; namely, sales, expenses and accounting policy measures. Second, we extend these prior studies by identifying three sub-groups of SICS-NAICS combinations: intact industries (SICS industries all of whose members have the same NAICS codes), cleaned industries (SICS industries whose members with different SICS codes have been deleted from the final NAICS industries) and consolidated industries (NAICS industries whose members have been formed from many SICS industries). Bhojraj, Lee & Oler (2003) employ a single grouping of industries, that is, firms are either SICS or NAICS; and Krishnan & Press (2002) use two groupings: "single-mapping" (all NAICS came from the same SICS) and "multiple-mapping" industries, but find no systematic reason why some NAICS are more homogenous and others are not. On the other hand, we offer a systematic reason why some industries are and are not classified as more homogenous under NAICS. By employing more systematically defined categories, we hope to improve guidance for financial statement analysis.

Our research design examines the inputs to the accounting ratio measures because of the extensive use of industry classifications in ratio analysis. The Canadian Institute of Chartered Accountants sponsored an extensive research report (CICA, 1993) that provides conceptual constructs that guide our analysis. The CICA study notes that (1) the nature of a firm's business and (2) the choice of accounting policies are two important inputs that affect the comparability of ratios. Ratios are well known to have poor statistical properties (e.g., see discussions in Kane & Meade, 1998; Mcleary & Trigeiros, 2002; and Hopwood & Keown, 2003). We represent the nature of a firm's business by using two operations-oriented variables, the change in sales and change in expenses. Our first hypothesis examines whether these operational homogeneity measures differ - and improve - when firms are grouped by NAICS compared to when they are grouped by SICS. Given that the NAICS classifications were developed to better identify companies with similar operations, we hypothesize:

Hypothesis 1: Firms' sales and operating expenses are more homogenous when firms are reclassified from SICS industries into NAICS industries.

The second CICA (1993) factor, the choice of accounting policies, impacts inter-firm comparisons such as with ratio analyses, which are based on year-end results that will vary with GAAP choices. Such variations fall under what Barron (1986) refers to as "year-end heterogeneity". Consequently, we examine

the similarity of accounting policies, as disclosed in financial statements, under the different classification schemes and hypothesize:

Hypothesis 2: Firms' accounting policies are more homogenous when firms are reclassified from SICS industries into NAICS industries.

SAMPLE DESCRIPTION

Research Insight's Compustat database includes the SICS and NAICS codes for firms. A brief comparison of the codes follows. The SICS codes have (maximum) four-digit descriptions and the NAICS codes have (maximum) six digit descriptions, thereby offering greater detail in the classification of the firm. Even without the sixth digit, NAICS offers more classification categories than does SICS.

The comparisons adopted in this paper are between three-digit SICS industries (SIC3) and four-digit NAICS industries (NAICS4) because comparisons at these precisions use a similar number of classification categories and also yield sufficient data for analysis. For instance, the mean (median) number of firms in each SIC3 and NAICS4 industry group is 27 and 23 (9 and 7), respectively. The broader NAICS3 has a much larger mean of 76. The critical point is that comparisons between SIC3 and NAICS4 are more likely to involve reclassifications of firms rather than greater homogeneity by design because of the extra digits allowed in NAICS.

Table 1 presents SIC3 industry characteristics by economic sector. The purpose of the table is to provide an overview of how industry membership changes between classification schemes. The columns under "All Industries" provide the number (No) and the percent (Pct) of SIC3 firms that come from the applicable economic sector. For example, there are 124 separate SIC3 industries in the manufacturing sector, making up about 46% of all 269 SIC3 industries. These columns do not indicate the number of firms in the industries, just the number of industries in the sector. Thus, the manufacturing sector has the most diverse SICS descriptions.

The next two columns in Table 1, under "Base Sample," provide the same information for the SIC3 industries with more than ten members, from which the sample for this study is drawn. Ten represents the minimum number of industry members used for this study, judgmentally chosen to provide an adequate number of industries yet be able to offset the effect of too few firms in an industry (other cutoffs produce similar, but weaker, results). The relative proportions of the Base Sample are similar to the proportions of "All Industries," however, some differences can be noted. The percentage of SIC3 industries from the manufacturing drops from 46% to 36% and the percent from the financial sector increases from 9% to 15%. However, because of the broad representation across industries, we believe that our study is not biased with regard to industry composition.

The last four columns provide the number and percent of the SIC3 members (from SIC3 industries with greater than 10 members) that remain "intact" or are "changed significantly". Bhojraj, Lee & Oler (2003) report that 80% of firms in the same two-digit SIC (SIC2) industry move together to the same NAICS-coded industry. The "Intact" column illustrates that when firms' reclassifications are examined by three-digit SIC3, then the percentage of industries whose members remain together when reclassified as a NAICS4 industry is lower: 39 of the 168 (23%) base sample industries have members that remain essentially "intact". INTACT is defined as when at least 85% of the member-firms remain together when reclassified from SIC3 and form

a single new NAICS4 industry. Those SIC3 industries with less than 50% of the member-firms having the same NAICS4 industry code are referred to as "Changed Significantly."

Table 1: SIC3 Industry Group Descriptions

This table summarizes the SICS industries by economic sector.

Economic Sector	SICS Codes Range	All Industries		Base Sample		Status			
						Intact		Changed Significantly	
		No	Pct	No	Pct	No	Pct	No	Pct
Agriculture	0-0900	5	1.9	1	0.5	0	0	1	2
Mining	1000-1400	7	2.6	5	2.9	2	5	0	0
Construction	1500-1900	7	2.6	4	2.4	0	0	3	5
Manufacturing	2000-3900	124	46.1	73	43.4	15	39	21	36
Utilities	4000-4900	23	8.5	16	9.5	5	13	6	10
Wholesale	5000-5100	19	7.1	13	7.7	4	10	8	14
Retail	5200-5900	21	7.8	16	9.5	4	10	5	9
Financial	6000-6900	25	9.3	17	10.1	3	8	2	3
Services	7000-8900	37	13.7	23	13.7	6	15	12	21
Administration	9000	1	0.4	1	1	0	0	0	0
Total		269	100	168	100	39	100	58	100

SICS – Standard Industry Classification System code.
No – number of industries in the economic sector.
Pct – percent of total industries included in the economic sector.
All Industries- this column summarizes the number (No) and percent (Pct) of all 3-digit SIC code industries by economic sector.
Base Sample - this column summarizes the number (No) and percent (Pct) of all 3-digit SIC code industries with more than ten industry members by economic sector.
Other cutoffs for minimum industry membership produce similar, but weaker, results.
Intact – this column summarizes the number (No) and percent (Pct) of all 3-digit SIC code industries that have at least 85% of their membership with the same NAICS code (North American Industry Classification System).
Changed Significantly - this column summarizes the number (No) and percent (Pct) of all 3-digit SIC code industries that have at most 50% of their membership with the same NAICS code.

Another observation is that the percentage of industries that remains intact differs by economic sector. Out of the 73 Base Sample manufacturing industries (SIC codes 2000-3900), 15 (21%) remain intact, compared to 2 of 5 (40%) industries in the mining sector (SIC codes 1000-1400). In general, we report a high proportion of industries that exhibit significant membership changes when the firms are reclassified from

SIC3 to NAICS4. Twenty-one (29%) of the 73 industries in the manufacturing sector and 12 (52%) of the 23 industries in the Services sector (SIC codes 7000-8900) significantly change. However, only 2 (12%) industries in the financial sector have significant member-firm changes. Based on Table 1, reclassifying firms from SIC3 membership to NAICS4 membership alters the group association of many firms. We next turn to evaluate whether these changed reclassifications result in more homogenous groups.

SELECTION OF INDUSTRIES FOR ANALYSIS

In this section, we describe the SICS to NAICS industry reclassifications and identify those industries that are INTACT, those that are CLEANED, and those that are CONSOLIDATED. The Appendix lists the 39 intact industries, the 88 cleaned industries, and the 19 consolidated industries.

INTACT industries are those whose member firms all have the same NAICS4 and SIC3 codes. In order to track firms between classification schemes, we employ the terms, pctnfs, to refer to the percent of NAICS4 firms that come from the same SIC3 industry, and pcts2n to refer to the percent of SIC3 firms that go to the same NAICS4 industry. Thus, INTACT industries' pctnfs and pcts2n are both equal to, or greater than, 0.85 (we use 85% instead of 100% in order maintain sample sizes).

Non-INTACT industries are divided into CLEANED and CONSOLIDATED industries. CLEANED industries have pcts2n greater than 0.85 and pctnfs less or equal to 0.5. Thus, CLEANED NAICS industries are made up of members that are essentially from the same SICS industry but that SICS industry has been broken up into more homogenous groups. CONSOLIDATED industries have pcts2n and pctnfs less or equal to 0.5. Thus, CONSOLIDATED NAICS industries are made up of members from many different prior SICS industries.

METHODS AND MEASURES

Revenue and Expense Based Measures of Homogeneity

To examine the hypotheses, we compare the financial statement data of an industry's member-firms when classified under the different schemes of SICS and NAICS. Tests of the hypotheses are based on comparisons of (1) correlations of changes in expenses and changes in revenues among industry members, and (2) the means of proxies for member-firm accounting policies. Greater similarity of these measures would indicate more homogenous industries. We next describe how these measures are determined.

Hypothesis 1, that the mean NAICS homogeneity is greater than the mean SICS homogeneity, is tested using two measures of a firm's business operations. First, the expense-based homogeneity measure is determined by calculating the correlation of within-industry members' change in year-to-year operating expenses because expenses reflect operations. For instance, external economic conditions will impact a high technology firm differently than a low technology firm. Labor and support expenses are likely to differ between the two types of firms, so the change in these expenses is likely to be different. The different rates of change in expenses reflect more than just differences in technology. A firm could have a low inventory strategy compared to a firm that has a strategy of immediately filling all customer orders, consequently storage costs would differ and differently impact the change in operating expenses between the firms with the differing strategies.

The operating expense correlation measure is based on the following calculations. Operating expenses (net of depreciation), OE, equals sales minus operating income plus depreciation. The percentage change in operating expenses is

$$CHOE_{i,t} = [OE_{i,t}-OE_{i,(t-1)}]/ OE_{i,(t-1)} \qquad \textit{Formula (1)}$$

and is calculated for each firm, i, for each year, t, from 1996 to 2002. The correlations of CHOE of each member firm are determined with every other member firm in the same industry group, by year, over the seven-year period. The correlations of the year-to-year percent changes are then summed by industry and divided by the number of correlations (n) to get the mean expense correlation per industry (MCHOE). These correlations are calculated for both the SIC3 grouping of firms (MCHOES) and the NAICS4 grouping of firms (MCHOEN) because group membership will effect the mean correlation.

The revenue based homogeneity measures are calculated in a similar manner. The percentage change in net sales (S) is

$$CHS_{i,t} = [S_{i,t}-S_{i,(t-1)}/ S_{i,(t-1)}] \qquad \textit{Formula (2)}$$

and is calculated for each firm, i, for each year, t, from 1996 to 2002. The correlations of CHS of each member firm are determined with every other member firm in the same industry group, by year, over the seven-year period. The correlations of the year-to-year percent changes are summed by industry and then divided by the number of correlations (n) to get the mean sales correlation per industry (MCHSS for SIC3 and MCHSN for NAICS4).

Accounting Policy Based Measure of Homogeneity

To examine the second hypothesis, that the variability of accounting policies will be less for NAICS-based industries compared to SICS-based industries, we test for the similarity of the accounting policies adopted by firms within the two different classification schemes. The accounting policies chosen to examine are:

inventory policy (FIFO, LIFO, or other such as weighted average- WA);
debt policy (long term debt includes current portion, or current portion disclosed separately);
depreciation policy (straight-line, accelerated, or combination).

Compustat assigns numerical values to firms' accounting policies. As an example, in the inventory policy field, FIFO is assigned a value of 1, LIFO a value of 2, and weighted average a value of 4. Based on a numerical analysis of these numerical assignments, we find that these three accounting policies have a wide variability across our Base sample; numerical transformations of other accounting policy descriptions do not result in viable measures. On the other hand, these policies relate to the components of the ratios examined by Krishnan & Press; for these reasons, these policies were selected for tests of hypothesis 2.

To measure the variability in accounting policies, we rank the use of the policies so that within an industry, the most prevalent policy is given a value of 1; the second most prevalent policy is given a value

of 2, etc. For instance, if 60% of an SIC3's members use LIFO, 30% use WA and 10% use FIFO, then an indicator variable is assigned a value of 1 for the LIFO firms, a value of 2 for the WA firms, and 3 for the FIFO firms. POLICY is an industry-level measure and equals the mean of these rank variables, with a value closer to 1 (0) suggesting that industry members have more (less) similar accounting policies (use of standard deviation gives the parallel results). The inventory, debt, and depreciation disclosure policies of the SIC3 industries have mean measures of MINVS, MDEBTS, and MDEPNS, respectively, and MINVN, MDEBTN, and MDEPNN correspond to the NAICS4 industry measures.

Tests of hypotheses

For the basic tests of the first hypothesis, we compare the mean MCHOES to the mean MCHOEN and the mean MCHSS to the mean MCHSN for the sample. For the basic tests of the second hypothesis, we compare the mean MINVS, to the mean MINVN, the mean MDEBTS to the mean MDEBTN, and the mean MDEPNS to the mean MDEPNN for the sample. The t-test for these comparisons is

$$t = (X_S - X_N)/ [((sd_S)^2/n_S) – ((sd_N)^2/n_N)]^{1/2} \qquad \textit{Formula (3)},$$

where X is the mean homogeneity measure, the subscripts s and N refer to SICS-based and NAICS-based measures respectively, sd is the standard deviation, and n is the sample size. This test assumes that the homogeneity measures are drawn from independent samples. Because the underlying assumptions of the classifications are different, then the measures are assumed to be independent.

Additional Tests

This section describes the tests on the classification subgroups. As described above, tracking firms between SICS and NAICS groupings produces the three general types of firms described above (i.e. INTACT, CLEANED and CONSOLIDATED).

In the first set of additional tests, the mean SIC3 measures (e.g. MCHOES, MINVS, etc.) of the INTACT industries are compared to the measures of the non-INTACT industry measures. For this test, the SIC3 industries are broken into three groups: pcts2n and pctnfs greater than 0.85 (i.e. INTACT), pcts2n less than or equal to 0.5 (i.e. non-INTACT), and all others; thus, comparisons between the INTACT and the non-INTACT groups are expected to provide a requisite contrast. The comparisons serve as preliminary evidence of our hypotheses because the non-INTACT group represents the base group of industries from which the CLEANED and CONSOLIDATED industries are formed.

A second set of tests compares the mean CLEANED NAICS4 industry measures to the prior sourced SIC3 industry measures, i.e., compares MCHOEN and MCHOES. Because the CLEANED industries are formed from the non-INTACT industries, this test looks for evidence of improvement. The third set of tests compares the mean CONSOLIDATED NAICS4 industry measures to the prior sourced CONSOLIDATED-sourced SIC3 industry measures, for instance compares MCHOEN and MCHOES. Like the second set of tests, the definition of CONSOLIDATED requires combinations of paired SIC3 and NAICS4, so sample sizes are larger than indicated by just the CONSOLIDATED NAICS4 industries. Because the CONSOLIDATED industries are formed from the non-INTACT industries, this test also looks for evidence of improvement.

RESULTS

Tests of Basic Hypotheses

Table 2 presents a summary of the homogeneity measures' distributions. In Panel A, the mean homogeneity measures for each classification scheme support the hypotheses. The mean operating expense and sales correlation measures calculated for the NAICS-defined industries are greater than those for the SICS-defined industries. Untabulated t-statistics are 2.95 for MCHOE comparisons and 2.66 for MCHS comparisons (p-values less than 0.05). Thus, hypothesis 1 is supported. Similarly, for the accounting policy measures, all the NAICS measures are lower than for the SICS measures. Untabulated t-statistics are 1.75 (p-value less than 0.10) for MINVN comparisons, 1.98 (p-value less than 0.05) for MDEBTN, and 0.84 (insignificant) for MDEPNN comparisons. Overall, there is weak support for Hypothesis 2. For both tests, other cutoffs for minimum industry membership produce similar, but weaker, results.

Table 2: Summary of Distributions of Homogeneity Measures

Panel A - This Panel presents the mean and standard deviation of homogeneity measures used in this study, by industry classification.

	$MCHOE^S$	$MCHS^S$	$MINV^S$	$MDEBT^S$	$MDEPN^S$	$MCHOE^N$	$MCHS^N$	$MINV^N$	$MDEBT^N$	$MDEPN^N$
Mean	0.207	0.213	1.324	1.272	1.144	0.253	0.252	1.287	1.246	1.133
Standard deviation	0.156	0.137	0.244	0.154	0.147	0.198	0.189	0.244	0.17	0.154

superscripts in this Panel represent:
S - calculations are based on SICS classifications, and
N - calculations are based on NAICS classifications.

Panel B - This Panel presents the mean, first quartile (Qtr 1), and third quartile (Qtr 3) homogeneity measures used in this study, by industry type.

	Intact			Cleaned			Consolidated			
Measure	mean	Qtr 1	Qtr 3	mean	Qtr 1	Qtr 3	mean	Qtr 1	Qtr 3	
MCHOE	0.148	0.096	0.234	0.152	0.081	0.177	0.328	0.16	0.463	
MCHS	0.161	0.099	0.216	0.156	0.096	0.176	0.318	0.173	0.423	
MINV	1.361	1.25	1.5	1.294	1.25	1.4	1.219	1	1.5	
MDEBT	1.32	1.266	1.363	1.294	1.181	1.375	1.25	1	1.344	
MDEPN	1.137	1.018	1.205	1.148	1.111	1.222	1.036	1	1.214	

MCHOE – the mean correlation per industry among member firms' percentage changes in operating expenses.
MCHS - the mean correlation per industry among member firms' percentage changes in sales.
MINV – the mean measure per industry for member firms' use of similar inventory accounting policies.
MDEBT - the mean measure per industry for member firms' use of similar debt accounting policies.
MDEPN - the mean measure per industry for member firms' use of similar depreciation accounting policies.

Panel B of Table 2 provides summaries of the homogeneity measures, by type. Overall, the median operational homogeneity measures (MCHOE and MCHS) for the INTACT and for the CLEANED are less than those of the CONSOLIDATED industries. The median CONSOLIDATED industries accounting policy disclosure homogeneity measures are closer to one than the other two industry types. However, our tests are

not directly concerned with which of these types is more or less homogeneous but, rather, whether the NAICS grouping improve on the former SICS groupings. We now turn to presenting analyses on the Additional Tests.

Additional Tests of Expense and Sales Correlation Measures

Test results for differences in the mean NAICS correlation and the mean SICS correlation are presented in Table 3 and are made up of t-tests of the operational homogeneity measures and p-values indicating significance. Panels A and D are group mean t-tests and panels B and C are paired t-tests. Table 3, is a test for differences in the standard deviations of mean correlation measures (SDCHOE for CHOE and SDCHS for CHS).

In Panel A, Table 3, the mean homogeneity measures are higher for INTACT industries, but they are not statistically different, thus the direction of the homogeneity measures are correct but are not at significant levels. It must be noted that the Non-INTACT group includes both CLEANED and CONSOLIDATED industries, which are broken out in subsequent tests.

Panel B presents results of the second set of tests, which examine whether the NAICS4 grouping improves homogeneity measures by tracing the CLEANED NAICS industries back to their prior SIC3 industries and using paired t-tests. In Panel B, the t-statistic to test if the CLEANED NAICS4 MCHOE is greater than the prior non-INTACT SIC3 MCHOE measure is 3.45, indicating that the CLEANED NAICS4 industries are more homogenous than the prior SIC3 industries. The t-statistic for the MCHS test is 3.16 ($p<0.01$) and supports the same conclusions. The t-statistic (2.88) ($p<0.01$) that tests the mean of standard deviations of the sales correlations for each of the groups shows that the variation in the sales correlation among the non-INTACT SIC3 MCHS is wider than that of the CLEANED NAICS4 MCHS and provides additional support for our conclusions.

Results in Panel C report on the third set of tests of the CONSOLIDATED industries' operational homogeneity. As the tests in Panel B, the NAICS4 groupings are traced back to the prior SIC3 industries, so paired t-tests are used. The mean CONSOLIDATED industries' homogeneity measures are significantly lower than the non-INTACT industries' measures (the MCHOE t-stat=3.52 and the MCHS t-stat=2.75, both with $p<0.01$). The idea behind the CONSOLIDATED industries is that the prior SICS classification does not combine like companies so the NAICS method alters the composition of the associated firms. Yet, the direction of the homogeneity measures implies that the CONSOLIDATED industries are less homogenous than the prior non-INTACT industries. This may be due to the wide dispersion of the sourced SICS codes, unlike the CLEANED NAICS industries, wherein all member firms are from the same prior SICS grouping.

Based on the prior results, it appears that the new NAICS CONSOLIDATED industries are less homogenous than the former SICS non-INTACT industries, but the NAICS CLEANED industries are more homogenous than the former SICS non-INTACT industries. Therefore, we examine whether the NAICS CLEANED industries are more homogenous than the NAICS CONSOLIDATED industries. In Panel D, the CLEANED measures are significantly greater than the CONSOLIDATED measures, with the t-statistic for the MCHOE test equal to 2.70 and the t-statistic for the MCHS test equal to 2.66 (both with $p<0.01$). These results support the conclusion that the CLEANED industries are more homogenous than the CONSOLIDATED industries, although the t-statistic for the standard deviation test of MCHS is 2.33 ($p<0.05$), indicating a wider variation on sales correlation measures among the CLEANED industries. Other cutoffs for minimum industry membership produce similar, but weaker, results.

Table 3: Tests of Hypothesis 1

Panel A - This panel compares the INTACT SIC3 group mean MCHOE and MCHS measures to the non-INTACT SIC3 group mean measures.

	n	MCHOE	MCHS	SDCHOE	SDCHS
INTACT	39	0.16	0.17	0.15	0.15
NON-INTACT	206	0.14	0.15	0.15	0.16
t-statistic		1.33	0.99	0.32	0.74
(p-value)		(ns)	(ns)	(ns)	(ns)

Panel B - This panel presents matched-pair comparisons between CLEANED NAICS4 and prior NON-INTACT SIC3 mean and standard deviation CHOE and CHS.

	n	MCHOE	MCHS	SDCHOE	SDCHS
CLEANED	99	0.15	0.18	0.14	0.15
NON-INTACT	99	0.12	0.15	0.14	0.16
Mean difference	99	0.03	0.03	0	-0.01
t-statistic		3.45	3.16	0.71	2.88
(p-value)		(p<0.01)	(p<0.01)	(ns)	(p<0.01)

Panel C - This panel presents matched-pair comparisons between CONSOLIDATED NAICS4 and prior NON-INTACT SIC3 mean and standard deviation CHOE and CHS.

	n	MCHOE	MCHS	SDCHOE	SDCHS
CONSOLIDATED	88	0.1	0.11	0.14	0.14
NON-INTACT	88	0.13	0.13	0.13	0.14
Mean difference	88	-0.03	-0.02	0.01	0
t-statistic		3.52	2.75	1.09	0.13
(p-value)		(p<0.01)	(p<0.01)	(ns)	(ns)

Panel D - This panel presents matched-pair comparisons between CLEANED NAICS4 and CONSOLIDATED NAICS4 mean and standard deviation CHOE and CHS.

	n	MCHOE	MCHS	SDCHOE	SDCHS
CLEANED	184	0.17	0.18	0.15	0.16
CONSOLIDATED	128	0.13	0.14	0.15	0.15
t-statistic		2.7	2.66	1.06	2.33
(p-value)		(p<0.01)	(p<0.01)	(ns)	(p<0.05)

ns – not significant at normal levels.
MCHOE – the mean correlation per industry among member firms' percentage changes in operating expenses.
MCHS - the mean correlation per industry among member firms' percentage changes in sales.
SDCHOE – the standard deviations of the industry correlations of member firms' percentage changes in operating expenses.
SDCHS - the standard deviations of the industry correlations of member firms' percentage changes in sales.

Additional Tests of Accounting Policy Measures

Test results for differences in the two classification schemes' variations in accounting policies are presented in Table 4. Tests are t-tests of accounting policy homogeneity measures. Mirroring Table 3, panels A and D are group mean t-tests and panels B and C are paired t-tests.

In Panel A of Table 4, the preliminary test of INTACT to non-INTACT industries echoes the operational homogeneity test in that the mean accounting policy rank measures are not significantly different between groups. The non-INTACT industries are made up of subsequent CLEANED, CONSOLIDATED, and other industries so this test is not likely to easily identify differences.

Turning to Panel B, the differences between the new CLEANED NAICS industries and the prior SICS industries are consistent with the hypothesis. The mean inventory and debt disclosure policy rank measures are lower for the CLEANED NAICS4 group compared to the prior SIC3 group means and statistically significant (the MINV t-stat=4.10 and the MDEBT t-stat=6.15, both with $p<0.01$); the mean depreciation policy homogeneity measure is also lower but not at a normal level of significance. The directions of these differences are consistent with operational test results of Panel B, Table 3, and together the tests provide strong evidence of the greater homogeneity of the cleaned industries.

When the CONSOLIDATED NAICS industries are matched to their sourced SIC3 industries, however, the evidence is not consistent with the hypothesis. In Panel C, the mean depreciation policies rank measure (MDEPN) is greater in the new the CONSOLIDATED NAICS industries compared to the prior SIC3 industries (t-stat=2.00; $p<0.05$). Because the lower mean rank in the NAICS categories indicates greater homogeneity, the evidence suggests that the NAICS categories are less homogenous. This finding is consistent with the results of operational homogeneity additional tests.

We also test whether the accounting policy homogeneity of the CLEANED industries differs from that of the CONSOLIDATED industries. In Panel D, the inventory and debt disclosure policy mean ranks are lower for the CLEANED NAICS4 compared to the CONSOLIDATED group. This suggests that there is less variability in the disclosure policies of the CLEANED groups and is consistent with the conclusions from Table 3 where the evidence suggested that the homogeneity of the CLEANED group is greater. Thus, again, the two tests provide strong evidence that the subsequently formed CLEANED industries improve member-firm homogeneity (other cutoffs for minimum industry membership produce similar, but weaker, results).

CONCLUSIONS

This study uses financial statement data to compare the homogeneity of SICS-based classifications with NAICS-based homogeneity. The first measure of industry homogeneity is the correlation of changes in operating expenses among the member firms. We also use the similar measure, the correlation of changes in revenues among member firms. The second measure of industry homogeneity is the variability of inventory, debt, and depreciation accounting policies among industry members.

Table 4: Tests of Hypothesis 2

Panel A - This panel compares the INTACT SIC3 group mean MINV, MDEBT, and MDEPN to the NON-INTACT SIC3 group mean.

	MINV (n)	MDEBT (n)	MDEPN (n)
INTACT	1.36 (38)	1.31 (39)	1.14 (39)
NON-INTACT	1.32 (201)	1.30 (206)	1.14 (206)
t-statistic	0.92	0.64	0.14
(p-value)	(ns)	(ns)	(ns)

Panel B - This panel presents matched-pair comparisons between CLEANED NAICS4 mean MINV, MDEBT, and MDEPN and prior NON-INTACT SIC3 mean.

	MINV (n)	MDEBT (n)	MDEPN (n)
CLEANED	1.26 (96)	1.22 (99)	1.17 (99)
NON-INTACT	1.32 (96)	1.30 (99)	1.16 99)
Mean difference	-0.06	-0.08	0.01
t-statistic	4.1	6.15	1.15
(p-value)	(p<0.01)	(p<0.01)	(ns)

Panel C - This panel presents matched-pair comparisons between CONSOLIDATED NAICS4 and prior NON-INTACT SIC3 MINV, MDEBT, and MDEPN.

	MINV (n)	MDEBT (n)	MDEPN (n)
CONSOLIDATED	1.32 (84)	1.27 (88)	1.18 (87)
NON-INTACT	1.31 (84)	1.29 (88)	1.15 (87)
Mean difference	0.01	-0.02	0.03
t-statistic	0.68	-1.2	2
(p-value)	(ns)	(ns)	(p<0.05)

Panel D - This panel presents matched-pair comparisons between CLEANED NAICS4 and CONSOLIDATED NAICS4 mean MINV, MDEBT, and MDEPN.

	MINV (n)	MDEBT (n)	MDEPN (n)
CONSOLIDATED	1.36 (182)	1.31 (184)	1.16 (184)
CLEANED	1.26 (125)	1.19 (128)	1.16 (128)
t-statistic	3.84	8.57	0.34
(p-value)	(p<0.01)	(p<0.01)	(ns)

ns – not significant at normal levels.
MINV – the mean measure per industry for member firms' use of similar inventory accounting policies.
MDEBT - the mean measure per industry for member firms' use of similar debt accounting policies.
MDEPN - the mean measure per industry for member firms' use of similar depreciation accounting policies.
SDINV – the standard deviations of the industry measure for member firms' use of similar inventory accounting policies.
SDDEBT - the standard deviations of the industry measure for member firms' use of similar debt accounting policies.
SDDEPN - the standard deviations of the industry measure for member firms' use of similar depreciation accounting policies.

The conclusion from the basic tests of the hypotheses is that NAICS industries are more homogenous than SICS industries. This is consistent with Krishnan & Press (2002), but is based on more fundamental measures. Where Krishnan & Press' tests are based on derived measures, ours are based on financial statement accounting data. Our results are stronger for the expense and sales measures and weaker for the accounting policy measures.

We performed additional tests of sub-categories of NAICS-SICS industry mappings. The results indicate that the above-noted conclusions from the basic hypotheses tests have to be used cautiously. CLEANED industries, that have taken the SICS grouping of firms and weeded out firms that are more appropriately classified under a different NAICS code, are more homogenous than the original SICS firms. Thus, comparisons such as ratio analysis among members from these types of industries may provide improved analyses. It also appears that the CONSOLIDATED industries may not provide a more homogenous grouping than the prior SICS classifications. Thus, comparisons among members from NAICS CONSOLIDATED industries may not provide improved information over the alternative SICS defined groupings. Our classifications of industries into INTACT, CLEANED, and CONSOLIDATED types are rough, so future research should test and refine these definitions and further evaluate if the CONSOLIDATED industries offer any improved analyses. In addition, our tests utilize a minimum industry membership of 10 firms; other cutoffs for minimum industry membership produce similar, but weaker, results. Future research may also replicate Clarke's (1989) study to see if the refinements of NAICS classifications, e.g. from two-digit NAICS to six-digit NAICS, are able to provide improvements in homogeneity.

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Appendix: Descriptions of Industries Classified As INTACT, CLEANED and CONSOLIDATED			
Panel A – INTACT Industries			
SIC3	NAICS4	SIC description	
1380	2131	Oil and gas field services	
1400	2123	Mining non-metallic	
2000	311	Production of food products	
2020	3115	Dairy products production	
2030	3114	Canned & frozen fruits& vegetable production	
2060	3113	Confectionery product mftg	
2080	3121	Beverage production	
2520	3372	Office furniture production	
2800	325	Chemicals and allied products	
2820	3252	plastic materials mftg	
2840	3256	Soap & detergent mftg	
2870	3253	Agriculture chemical prod'n	
3080	3261	Plastic products mftg	
3550	3332	Special industry machinery	
3630	3352	Household appliance mftg	
3720	3364	Aircraft parts	
3730	3366	Ship & boat building	
4010	4821	Railroads	
4510	4811	Air transportation	
4730	4885	Arrangement of freight transport	
4830	5151	Radio and television	
4940	2213	Water supply	
5050	4235	Metal & minerals wholesale	
5060	4236	Electric goods wholesale	
5080	4238	Machinery wholesale	
5190	4249	Non-durables wholesale	
5310	4521	Department stores	
5410	4451	Grocery stores	
5660	4482	Shoe stores	
5960	4541	Non-store retailers	
6210	5231	Security brokers	
6410	5242	Insurance agents	
6510	5311	Real estate operators	
7360	5613	Personnel supply services	
7510	5321	Auto rental	

Appendix: Descriptions of Industries Classified As INTACT, CLEANED and CONSOLIDATED			
8050	6231	Nursing care facilities	
8070	6215	Medical dental labs	
8080	6216	Home health care	
8730	5417	Research & development testing	
Panel B– CLEANED Industries.			
NAICS4	NAICS4 description	NAICS4	NAICS4 description
1113	Fruit & nut farming	4862	Natural gas pipeline
1114	Greenhouse nursing	4869	Other pipeline
1119	Other crop farming	4883	Support for water transportation
1133	Logging	5112	Software publishers
2331	Land subdivision	5131	Radio & TV broadcasting
2353	Electric contracting	5132	Cable network
2373	Street & bridge construction	5141	Information services
2379	Other heavy construction	5142	Data processing services
2381	Foundation & structure contractors	5152	Cable programming
2389	Other specialty trades	5171	Wired telecommunications
3111	Animal food mftg	5173	Telecommunications resellers
3131	Fiber & yarn mills	5174	Satellite telecommunications
3149	Other textile mills	5179	Other telecommunications
3150	Apparel mftg	5181	Internet service providers
3212	Veneer & plywood mftg	5182	Data processing services
3274	Lime & Gypsum mftg	5312	Real estate brokers
3312	Steel product mftg	5331	Lessor of intangible assets
3325	Hardware mftg	5410	Professional scientific services
3361	Motor vehicle mftg	5415	Computer systems design
3362	Motor vehicle body mftg	5611	Office admin services
3379	Other furniture mftg	5612	Facilities support services
4211	Auto & other wholes.	5616	Investigative & Security Services
4213	Lumber & other wholes.	5619	Other Support Services
4214	Commercial eqmt wholes.	5621	Waste Collection
4217	Hardware & plumbing wholes.	6112	Junior Colleges
4218	Machinery eqmt wholes.	6113	Universities
4219	Misc durable goods wholes.	6114	Computer & management training
4221	Paper products wholes.	6115	Technical & Trade Schools
4222	Druggist supplies wholes.	6116	Other Schools and Instruction
4224	Grocery products wholes.	6212	Dentist offices
4227	Petroleum products wholes.	6213	Other health practicioners

Appendix: Descriptions of Industries Classified As INTACT, CLEANED and CONSOLIDATED			
4243	Apparel & piece goods wholes.	6222	Psychiatric hospitals
4412	Other motor vehicle dealers	6223	Specialty hospitals
4442	Lawn & garden stores	6239	Other residential care facilities
4471	Gas stations	6241	
4483	Jewelry & leather goods stores	7131	Amusement parks
4511	Music & sporting goods stores	7132	Gambling industries
4512	Music & book stores	7139	Other amusement parks
4532	Office supplies	7222	Limited service eating establishments
4533	Other merchandise stores	7223	Specialty food services
4539	Other miscellaneous retailers	8112	Electronics repairs
4832	Inland water transportation	8121	Personal care services
4842	Specialized freight trucking	8122	Death care services
4854	School & employee bus transportation	8123	Dry cleaning
Panel C– CONSOLIDATED Industries.			
NAICS4	NAICS4 description	NAICS4	NAICS4 description
2362	Nonresidential construction	3346	Magnetic & optical product mftg
2349	Heavy construction	3359	Other electric eqmt mftg
3133	Textile & fabric mills	4251	Electronic markets wholesale
3255	Paint & adhesive mftg	5122	Sound recording
3271	Clay product mftg	5133	Telecommunications
3314	Non-ferrous metal prod'n	5239	Other financial investments
3324	Boiler, tank, container mftg	5322	Consumer goods rental
3326	Spring & wire product mftg	5419	Other professional services
3334	Heating & A/C mftg	8129	Other personal services
3333	Commercial machine mftg		
Sources for industry descriptions: SIC3 source: http://www.osha.gov/pls/imis/sic_manual.html. NAICS4 source: http://www.census.gov/epcd/www/naicstab.htm.			

LONG-TERM MARKET REACTIONS TO EARNINGS RESTATEMENTS

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ABSTRACT

Since the recent accounting scandals ignited by the Enron fiasco, earnings restatements due to accounting irregularities[1] have drawn significant attention from the public in both academia and practice. Since accounting irregularities are intentional misrepresentations of accounting information by the reporting entity, earnings restatements due to these do have different connotations to the capital market than other earnings information releases. Thus, how efficiently the capital market reacts to information release of the restating firms can be a valuable research question. As a way of addressing this question, the long-run stock price behavior of the restating firms after the restatements will be examined in this study.

INTRODUCTION

Ever since recent accounting scandal ignited by Enron fiasco, earnings restatements due to accounting irregularities[11] draw significant attention from public in academia and practice. Since accounting irregularities are intentional misrepresentations of accounting information by the reporting entity, earnings restatements due to these (hereafter called earnings restatements) do have different connotations to the capital market than other earnings information releases. First, earnings restatements may increase the uncertainty of the reporting entity because they usually cause class action lawsuits, management shuffle, restructuring, and even bankruptcy. Secondly, earnings restatements impair the information quality of the reporting entity because restating firm's information may not be as reliable to investment public as it used to be prior to the earnings restatement. Then, these higher uncertainty and lower information quality can increase the risk premium and stock return volatility of the restating firms (See Aboody (2005), Francis (2005), and Li (2005)), which may reflect that it is more difficult and time consuming for the capital market to response to restating firms' information release after the earnings restatements. Thus, how efficiently the capital market reacts to information release of the restating firms can be a valuable research question. As a way of addressing this question, the long-run stock price behavior of the restating firms after the restatements will be examined in this study.

Prior studies on the post-announcement stock price performance of earning restatement such as Hirschey et al. (2003), General Accounting Office (GAO) (2002), and Wu (2002) document negative abnormal stock returns of the restating firms in the months following the restatement announcement, which is contradictory to the efficient market hypothesis predicting no abnormal returns. All these studies exclusively used the Cumulative Abnormal Returns (CAR) approach to measure stock price performance. Hirschey et al. (2003) use the market-adjusted, the market-model adjusted and the mean-adjusted CAR

approaches. GAO (2002) uses the market-adjusted CAR approach. Wu (2002) uses the β- and size- adjusted CAR approach. For example, Wu (2002) observes over 10 percent negative CAR in the year following the announcement. She suggests two potential explanations: some firms fail to provide restated number at the same time as restatement announcements and leave the issue unconcluded; and investors keep revising their beliefs according to information received subsequently. Taken at face value, this evidence is consistent with the notion that market under-reacts to earning restatements.

However, the CAR approach does not provide a precise picture of long-term stock performance due to its embedded structural problem of simple summation of periodic abnormal returns rather than compounding of them and its cross-sectional dependence problem. And recent studies suggest that the results of long-run abnormal returns should be interpreted with caution because the abnormal return metrics are severely mis-specified. Misspecification of abnormal stock returns can cause some methods to detect spurious anomalies. Although various methodologies have been proposed to measure long-run stock price performance, each and every methodology has some sort of measurement problem or problems. And it is hard to identify the best methodology addressing these measurement problems, either. Thus, among those various methodologies, the three most popular and sound methodologies are used in this study to measure long-term stock price performance of restating firms after the earnings restatements. Those are the CAR, the buy-and-hold abnormal return (BHAR), and the calendar time portfolio approaches.

Thus, the purpose of this paper is to examine the long-term stock price behavior of restating firms using the above mentioned three major methodologies for measuring long-term stock returns. Our empirical results suggest that stocks of restating firms do not underperform or outperform the market in the year following the announcement day, supporting the efficient market hypothesis.

The remainder of this paper is organized as follows. Literature on methodologies for long-term stock returns is discussed in the next section that is followed by selection of sample firms and their data. Empirical tests using the above-mentioned three approaches and their results are presented and discussed in the following section. Conclusions are addressed in the final section.

LITERATURE REVIEW

Although there is substantial variation in the measures and test statistics of abnormal returns, there are three major approaches to measure the long term stock price performance: the cumulative abnormal return (CAR) approach, buy-and-hold abnormal return (BHAR) approach, and the calendar time portfolio approach. In the CAR approach, the abnormal performance is measured by the sum of either the daily or monthly abnormal returns over time (e.g., DeBondt and Thaler, 1985). The daily or monthly abnormal return is the difference between the actual return and a benchmark return, such as the predicted return estimated by the market model, the return of a reference portfolio or the return of a control firm. Beginning with Ritter (1991), the mean BHAR has become the most popular estimator of long-run abnormal returns (Mitchell and Stafford, 2000). In this approach, the abnormal performance is measured by the buy-and-hold return (BHR) differential between the sample firm and a benchmark. The BHR is calculated by compounding the daily or monthly returns over the post-event period. The calendar time portfolio approach requires first forming a portfolio at the beginning of each calendar month containing firms that had an event within the last one-, three-, or five-year (depending on the purpose of the study) and then calculating their mean return. The monthly returns of the portfolios are then regressed on Fama and French's (1993) three factors. The abnormal performance over

the post-event period is measured by the intercept term of the model. Jaffe (1974), Mandelker (1974), Fama (1998), and Desai et al. (2002) use various forms of the calendar time portfolio approach. Fama (1998) suggests that the heteroskedasticity of the portfolio's abnormal return caused by the changes in number of stocks in the portfolio over time can be solved by using the weighted least square (WLS) technique: i.e., using the number of stocks in the portfolio as the weight when running the regression.

The benchmark used to estimate the abnormal returns varies in many studies. A benchmark can be the return of a reference portfolio. The value-weighted and equal-weighted CRSP market indices are two conventional reference portfolios. Reference portfolios can also be the size, the book-to-market (BM) ratio, or β matched portfolios. To form these portfolios, researchers first divides all the NYSE/ASE, and NASDAQ stocks into deciles by size, BM ratio, or β in June or December each year. The number of deciles varies in different studies. Some studies, e.g., Barber and Lyon (1997), divide firms into 50 deciles (10 size deciles by 5 BM ratio deciles). The return for each decile is calculated by averaging the returns of all stocks in the decile. Thus, a size-adjusted abnormal return is the return of the sample firm minus the average return of all the firms in the same size decile. Since firms might change deciles only once a year, the benchmark returns is equivalent to investing in an equal weighted decile portfolio with monthly rebalancing. A benchmark can also be the return of the control firm. The control firm is the firm that has similar characteristics as that of the sample firm. One way to identify the control firm is by first finding all firms with a market value between 70% and 130% of that of the sample firm; among the firms in this set, a firm that has BM ratio closest to that of the sample firm is finally selected as the control firm. Another type of benchmark is derived from a variety of asset-pricing models, such as the market model and the Fama and French (1993) three-factor model. The intercept term in these models represents the abnormal return. Nevertheless, Ball et al. (1995) document that many popular asset-pricing models are misspecified and, thus, may cause problems when using them to measure long-run stock price performance.

Lyon et al. (1999), Fama (1998), and Barber and Lyon (1997) have discussed how different types of misspecification can cause biases in various measures of long-run abnormal performance. These measurement biases are: 1) the new listing bias. It arises because sample firms generally have a long post-event history of returns while the reference portfolio constitutes new firms that begin trading subsequent to the event month. Since new firms concentrate in small growth stocks that historically have lower returns than the market (Brav and Gompers, 1997), the return of the reference portfolio is artificially depressed relative to the sample firms. Thus, comparing the return of the sample firms with the benchmark return yields positively biased test statistics, i.e., making it more likely to reject the null hypothesis of zero abnormal returns. On the other hand, if newly listed firms outperform the market, the test statistics will be downwardly biased; 2) the rebalancing bias. It arises since the return of a reference portfolio is calculated by compounding the equal weighted returns in each period while the returns of sample firms are compounded without rebalancing. The monthly rebalancing means that, at the beginning of each period, stocks that rose during the prior period (day or month) are reassigned the same weight as those dropped during the prior period. This is equivalent to the strategy of selling a portion of the past winners and buying past losers. Since past winners empirically outperform past losers in the intermediate term due to momentum (Jegadeesh and Titman, 1993), the long-run return of the reference portfolio is inflated relative to the sample firms, leading to a positive bias in measuring the long-run return of the sample firms. The magnitude of the rebalancing bias is more pronounced when using daily, rather than monthly, returns (Canina et al. 1996). The CAR approach is not subject to this bias since CAR is the sum of the difference between the returns of the sample firms and the

market index; 3) the skewness bias. It arises because the long-run BHAR is positively skewed. When the test statistic is calculated by dividing the mean BHAR by the cross-sectional standard deviation of the sample firms, the positive skewness leads to a negatively biased test statistic. The skewness bias is less serious in CAR approach because the monthly returns of sample firms are summed rather than compounded; 4) the cross-sectional dependence. It inflates test statistics because the number of sample firms overstates the number of independent observations. Two types of cross-sectional dependence are calendar clustering (e.g., many firms have the same event during the same day or month) and overlapping return calculations (e.g., a firm has the same event twice or more during the event period, say, one year). The calendar clustering might be driven by certain fundamental forces, while the overlapping return might be driven by the firm characters. In both cases, the observations are not independent. While both the CAR and BHAR approaches suffer from this problem, the calendar-time portfolio approach eliminates this problem since the returns on sample firms are aggregated into the return of a single portfolio; 5) the bad model problem. Because all models for expected returns fail to completely describe the systematic patterns in average returns during any sample period (Fama, 1998), the estimate of the expected returns cannot be accurate, leading to spurious abnormal return which grows with the return horizon and eventually becomes statistically significant. The bad model problem is most acute with BHAR approach since the measurement error grows fast with compounding returns.

Fama (1998) prefers the CAR approach to the BHAR approach in testing market efficiency because the former is less susceptible to misspecification, which is more severe when compounding daily or monthly returns. Nevertheless, Barber and Lyon (1997) and Lyon et al. (1999) show that the statistical problems of BHAR can be attenuated using elaborate techniques. Although the improved methods of BHAR produce inferences no more reliable than the simpler CAR method, the BHAR approach precisely measures investor experience and can answer the question of whether sample firms earn abnormal returns over a particular horizon of analysis. On the other hand, the CAR approach should be used to answer a slightly different question: do sample firms persistently earn abnormal monthly returns? Although the question is related, the CAR is a biased estimator of BHAR. Thus, they do not recommend the CAR approach; Barber and Lyon (1997) prefer BHAR with the control firm method to BHAR with the reference portfolio method since the former alleviates the new listing bias, the rebalancing bias, and the skewness bias; moreover, the matching firm method can be extended to include more firm characteristics, such as momentum, in addition to the firm size and BM ratio. Kothari and Warner (1997) find that parametric test statistics, such as the BHAR with market model, or three-factor model, do not satisfy the assumptions of zero mean and unit normality. They suggest using the BHAR in conjunction with the pseudoportfolio approach proposed by Ikenberry et al. (1995) might reduce the misspecification problem. Lyon et al. (1999) advocate two approaches: 1) the BHAR approach using a carefully constructed reference portfolio, such as the bootstrapped skewness-adjusted t-statistic or the pseudoportfolio approach; and 2) the calendar time portfolio approach. Mitchell and Stafford (2000) compare the measurement biases in these two approaches and suggest that the cross-sectional dependence problem is more severe than the violation of normality. The bootstrapping procedure assumes cross-sectional dependence and, thus, is not reliable. They recommend the calendar-time portfolio approach that assumes normality. Fama (1998) strongly advocates the calendar-time portfolio approach since: 1) monthly returns are less susceptible to the bad model problem; 2) it accounts for the cross-sectional dependence problem; and 3) the estimator is better approximated by the normal distribution, allowing for classical statistical inference. Nevertheless, the calendar-time portfolio approach does not reflect investors'

experience and has low power to detect abnormal performance since it averages over months of "hot" and "cold" event activity (Loughran and Ritter, 2000).

The results of long-run abnormal return might also be influenced by the low-priced stock effect. Conrad and Kaul (1993) and Ball et al. (1995) report that most of DeBondt and Thaler's (1985) long-run overreaction findings can be attributed to a combination of bid-ask effect and the low-price effect, rather than prior return. Although Loughran and Ritter (1996) question the methodology used in both studies, the impact of low-price stocks might be important when the sample firms are extremely low-priced since micro-structure problems, such as larger bid-ask spread, might decrease market participants' ability to capitalize on and hence cause the mis-valuation of these stocks.

Furthermore, recent empirical studies increasingly consider the momentum effect[2] when measuring long-run performance (e.g., Desai et al., 2002). Several studies document that restating firms experienced stock price decline in the six months before restatement announcement (e.g., Hirschey et al., 2003; Wu, 2002), none has control for the momentum effect when measuring the long-run performance.

In sum, there are various methodological problems in all three major approaches to measure long-run stock performance. But there is no panacea for all the above problems and no consensus on which approach is the best in measuring long-run stock performance. Thus, it is necessary to use all three major approaches such as CAR approach, the BHAR approach and the calendar-time portfolio approach to obtain more robust evidence on how the capital market responses to earnings restatements.

SAMPLE DESCRIPTION

A list of earnings restatements due to accounting irregularities announced during January 1997 through December 2002 is obtained from GAO. According to GAO's (2002) report, it is the most comprehensive sample during that period and contains 919 earnings restatements announced by 845 public companies. The accounting and stock returns data are drawn from COMPUSTAT and CRSP, respectively. The sample period almost covers the stock market run-up during the late 1990s and its collapse after March 2000. It is the period when the number and magnitude of earnings restatement surge to historic high, providing us a large number of observations. In this period, the public concern on corporate governance grew, leading to the passage of Sarbanes-Oxley Act in July 2002. There is no shift in legal regime during the sample period. We exclude earnings restatements announced by American Depository Receipts (ADRs) firms because they subject to different supervisory requirements.

Comparisons between characteristics of the restating firms and those of all COMPUSTAT firms are presented in Table 1. To measure the statistical significance of the difference between restating firms and all firms, a nonparametric test called Wilcoxon test was conducted, because the test avoids the problems caused by skewness and outliners. Since earnings restatements are unevenly distributed across industries (Beasley et al., 2000) and the average size, Book to Market (BM) ratio, and leverage vary from industry to industry; it might be more meaningful to use the industry-adjusted indicators. Industry-adjusted variables are calculated by subtracting the industry median value from the raw value of the variables. We identify companies in the same industry by matching their 4-digit historical SIC codes in the fiscal year when earnings restatement was announced. The reason to use the historical SIC code rather than the current SIC code is that some firms might change their industry after the sample period, making current SIC code an imprecise proxy for industry sector in the sample period. The earlier the event day the more severe the problem is.

Table 1 show that the raw BM ratios of restating firms are lower than those of all firms in 5 out of 6 sample years (1997, 1998, 1999, 2001, & 2002) and the entire sample period. But the differences are not statistically significant in any year. The industry adjusted-BM ratios of restating firms, however, are higher than the industry mean in all 6 testing years. And the differences are statistically significant in 3 out of 6 sample years (1999, 2000, & 2002) and the whole sample period. This discrepancy may suggest that restating firms concentrate in industries with more growth opportunities (the lower BM ratio than the overall) but they have less growth opportunities or are considered riskier than their peers (higher BM ratios than the industry mean).

Restating firms are larger in size: the mean market value of the restating firms is significantly larger than that of all COMPUSTAT firms in 4 out of 6 sample years (1999, 2000, 2001, & 2002) and the whole sample period. Our result is different from the previous results that suggest that restating firms concentrate in small firms (e.g., Beasley et al., 2000). This discrepancy might be due to a significant increase in the number of large restating firms during the sample period. The industry-adjusted market value of the restating firms are significantly higher than zero in 5 out of 6 sample years (1998, 1999, 2000, 2001, & 2002) and the whole sample period, indicating that restating firms are larger than their peers in the same industry.

Restating firms also have a lower leverage in terms of the ratio of total debt to total assets but the difference is significant in year 1977 and for the whole sample period, only, indicating restating firms have lower leverage ratios than the all COMPUSTAT firms. And the industry-adjusted leverage is significantly higher than zero in 5 out of 6 years (1997, 1998, 1999, 2000, & 2001) and the whole sample period, indicating that restating firms do have higher leverage ratios than the industry average.

Some companies restated the same financial statement more than once, making the second announcement less informative. To reduce this noise, only the first announcement in the sample is kept if a company announces restatement more than once within the same fiscal year. To isolate the effect of earnings restatement from other factors, companies that announce earnings figure or guidance, or bankruptcy over the (-5, 5) event-date window are excluded. The information on earnings or earnings guidance announcement and bankruptcy announcement is collected from the U.S. news in the Factiva database around the event day of each firm. Stocks selling below one dollar (so-called penny stocks) before earnings restatement are excluded because they have wide bid-ask spreads, high commissions, low liquidity (Conrad and Kaul, 1993) and higher delisting risks. After these procedures, the final sample includes 542 restating firms but the number of observations varies in different tests depending on data availability.

Table 2 shows that sample firms have average CAR of -7.40 percent and -9.05 percent over the (-1, 1) and (-5, 5) windows, respectively, both of which are statistically significant. None of daily abnormal returns are statistically significant from day 2 after the announcement of restatements in terms of the standardized cross-sectional (SCS) test (t-statistic) and the generalized sign test (Z-statistic).

Table 1: Descriptive Statistics of Restating Firms and All COMPUSTAT Firms

Year	N1	Restating firms	N2	All firms	Diff	z-stat	Industry adjusted	t-stat
Panel A Book-to-market ratio								
1997	61	0.572	33032	0.648	-0.076	-0.71	0.153	1.95
1998	70	0.502	32633	0.772	-0.27	-1.79	0.023	0.54
1999	122	0.694	31348	1.009	-0.315	-1.78	0.153	2.43*
2000	155	0.854	31629	0.983	-0.129	1.15	0.271	4.05**
2001	173	1.514	30032	1.837	-0.323	-1.64	0.371	1.75
2002	91	1.382	27145	1.774	-0.392	-0.15	0.353	2.06*
Total	672	1.004	185819	1.145	-0.141	-0.35	0.249	3.89**
Panel B Market value (Million dollars)								
1997	64	550.80	36827	1034.13	-483.33	-0.94	379.02	1.81
1998	70	2450.27	36857	1292.68	1157.59	0.70	2366.71	2.26*
1999	128	2234.65	36404	1566.89	667.76	2.99**	1737.54	2.06*
2000	166	1935.09	37222	1902.6	32.43	2.15*	1815.02	2.07*
2001	183	2796.24	35970	1580.11	1216.13	7.98**	2601.81	4.09**
2002	92	2695.20	33886	1496.68	1198.52	5.74**	1716.04	2.16*
Total	703	2230.89	217166	1484.35	746.54	8.44**	1921.11	5.66**
Panel C Total debt / Total asset								
1997	64	0.330	40002	0.513	-0.184	3.11**	0.107	4.10**
1998	71	0.234	39410	0.386	-0.152	-0.18	0.661	3.17**
1999	132	0.309	40310	0.486	-0.177	0.47	0.116	3.66**
2000	167	0.281	40616	0.601	-0.320	0.46	0.947	4.11**
2001	192	0.269	37973	0.900	-0.630	0.65	0.520	3.52**
2002	96	0.132	34591	0.281	-0.149	0.84	0.342	1.55
Total	722	0.283	232902	0.685	-0.402	2.10*	0.779	7.87**

N1 = the number of restating firms with non-negative value,
N2= the number of all COMPUSTAT firms with non-negative value,
Diff = the difference between the median (mean) of the restating firms and those of all the COMPUSTAT firms.
*, and ** = statistical significance at the 5% and 1% levels, respectively, using a 2-tail test.

Table 2: Abnormal Returns of Earnings Restatement Announcement

Day	Obs.	Mean Abnormal Return (%)	Median Abnormal Return (%)	Positive: Negative	Standardized z-stat	General Sign z-stat
-7	517	-0.61	-0.28	231:286	-2.754**	-1.012
-6	517	0.06	-0.08	252:265	0.266	0.839
-5	517	-0.43	-0.36	225:292	-1.711	-1.54
-4	517	-0.17	-0.47	222:295	-0.811	-1.805
-3	517	-0.94	-0.49	209:308	-2.994**	-2.950**
-2	516	-0.21	-0.14	246:270	-1.413	0.352
-1	515	-0.24	-0.16	241:274	-0.461	-0.048
0	510	-2.89	-1.01	204:306	-6.141**	-3.123**
1	505	-4.39	-1.41	187:318	-7.321**	-4.445**
2	507	0.04	-0.29	235:272	0.388	-0.248
3	507	0.12	-0.17	240:267	-0.218	0.197
4	506	-0.09	-0.24	230:276	-0.357	-0.652
5	507	0.00	-0.19	239:268	-0.591	0.108
6	508	-0.02	-0.10	242:266	-0.175	0.333
7	508	-0.25	-0.25	237:271	-0.896	-0.112
CAR						
(-1,+1)	515	-7.40	-3.62	165:350	-9.227**	-6.759**
(-5,+5)	517	-9.05	-4.10	184:333	-8.630**	-5.154**

The abnormal returns = the difference between the actual return and the predicted returns calculated by the market model.
Obs. = the number of sample firms.
*, and ** = statistical significance at the 5% and 1% level, respectively, using a 2-tail test.

Corhay and Rad (1996) show that since stock returns series generally exhibit time-varying volatility, a market model accounting for generalized autoregressive conditional heteroskedastic (GARCH) effects produces more efficient estimators of abnormal returns than a market model estimated using the ordinary least squares (OLS) method. Thus, we also estimate the abnormal returns using market model with the GARCH (1, 1) procedure. Results from the GARCH-adjusted technique presented in Table 3 are similar to those from the conventional CAR. The GARCH-adjusted average CARs are -7.42 percent and -8.96 percent in the (-1, 1) and (-5, 5) windows, respectively, both of which are statistically significant. None of daily abnormal returns are statistically significant from the day 2 after the announcement of restatements in terms of the standardized cross-sectional (SCS) test (t-statistic) and the generalized sign test (Z-statistic).

Table 3: GARCH-Adjusted Abnormal Returns of Earnings Restatement Announcement

Day	Obs.	Mean Abnormal Return (%)	Median Abnormal Return (%)	Positive:Negative	t-stat	Generalized Sign Z
-7	517	-0.58	-0.25	230:287	-2.640**	-1.207
-6	517	0.09	-0.12	246:271	0.388	0.203
-5	517	-0.42	-0.36	224:293	-1.878	-1.735
-4	517	-0.16	-0.41	221:296	-0.715	-2.000*
-3	517	-0.93	-0.46	204:313	-4.187***	-3.497***
-2	516	-0.20	-0.12	241:275	-0.913	-0.196
-1	515	-0.25	-0.19	239:276	-1.118	-0.331
0	510	-2.90	-0.94	204:306	-13.128***	-3.229**
1	505	-4.38	-1.48	187:318	-19.798***	-4.550***
2	507	0.07	-0.18	239:268	0.294	0.002
3	507	0.15	-0.13	241:266	0.665	0.18
4	506	-0.08	-0.33	233:273	-0.366	-0.491
5	507	0.01	-0.17	240:267	0.032	0.091
6	508	0.04	-0.09	243:265	0.16	0.315
7	508	-0.24	-0.22	239:269	-1.065	-0.04
CAR						
(-1, +1)	515	-7.42	-3.54	167:348	-9.750***	-6.687***
(-5, +5)	517	-8.96	-3.99	190:327	-8.723***	-4.731***

The abnormal returns = the difference between the actual return and the predicted returns calculated by the GARCH-adjusted market model.
Obs = the number of sample firms.
* and ** = statistical significance at 5% & 1%, respectively using a 2-tail test

In sum, the results in Table 2 and Table 3 suggest that the short term impact of earnings restatement announcements on stock prices seems to fade away by the day 1 after the announcement because none of daily abnormal returns are statistically significant from the day 2 after the announcement of restatements in terms of the standardized cross-sectional (SCS) test (t-statistic) and the generalized sign test (Z-statistic). Thus, it is reasonable to observe abnormal stock returns from day 2 after the announcement to measure the long-term stock performance of restating firms, which is used in this study.

EMPIRICAL TESTS AND RESULTS

Three approaches used in this study to measure the stock price performance of restating firms over the one year period and six months period following earnings restatement announcements are the CAR approach, the BHAR approach, and the calendar-time approach. The one-year post-announcement period extends from the 2nd day through 255th day following the announcement date, while the six-month post-announcement period extends from the 2nd day through 128th day after the announcement date. It is assumed that each month has 21 trading days except in the sixth and twelfth month when there are assumed be 22 trading days to complete the six-month and twelve-month event-day window.

CAR Approach

To compare with the prior studies on long-term stock performance of restating firms, the conventional CAR are estimated, first. Precision-weighted CAR advocated by Cowan (2002) are also estimated to control for the variance of stock returns. The abnormal returns are the error terms in the market model in which the CRSP equal-weighted market index and the value-weighted market index are used as the market returns. The estimation period is from 300 days to 66 days before the announcement date. The SCS test introduced by Boehmer et al. (1991) and the generalized sign test advocated by Cowan (1992) are performed to test the statistical significance of CAR.

The conventional and precision-weighted CAR of restating firms over the post-announcement period and test statistics are shown in Table 4. The results suggest that restating firms do not have significant abnormal performance over either the six months period or the one year period following the announcement of earnings restatements. Of the twelve months following earnings restatement, restating firms have significant abnormal return only in the month 1 using the SCS test, indicating that there are significantly negative abnormal returns during the first month after the announcement. But this may be because the short-term effect of the earnings restatement announcement on stock prices does not fade away by the first day following the announcement. There are no significant abnormal stock returns observed in any other months, the six month period, and the one year period. This indicates that the capital market prices the stocks of restating firms efficiently in spite of added uncertainties about the restating firms by earnings restatements, supporting the efficient market hypothesis.

Regarding the general sign test, only month 4, month 6, and month 8 show statistically significant z-values, indicating that there are significantly more restating firms with positive abnormal returns than restating firms with negative abnormal returns in those three months. There are no significant z-values observed in any other months than those three months, the six month period, and the one year period. This also indicates that overall the capital market performs efficiently in pricing stocks of restating firms in spite of added uncertainties about the restating firms by earnings restatements, supporting the efficient market hypothesis.

Figure 1 plots the mean, median, and precision-weighted CAR from the 63 days before to 252 days after earnings restatement. The result is in line with the findings that restating firms on average experience negative price drift before earnings restatement and no significant price drift over the long horizon following the announcement of earnings restatements.

In sum, the results from CAR approach presented in Table 4 and Figure 1 suggest that the capital market performs efficiently in pricing stocks of restating firms in spite of added uncertainties about the restating firms due to earnings restatements, supporting the efficient market hypothesis.

Table 4: Post-Announcement CARs of Restating Firms

Event Day	Obs.	Conventional CAR (%)	Precision Weighted CAR (%)	Positive: Negative	SCS test z-stat	Generalized Sign test z-stat
(2,22)	510	-2.22	-1.80	229:281	-2.420*	-0.905
(23,43)	509	0.11	0.03	241:268	0.058	0.202
(44,64)	495	0.27	0.14	228:267	-0.111	-0.375
(65,85)	488	1.23	0.19	251:237	0.146	2.007*
(86,106)	481	-1.19	-1.14	210:271	-1.448	-1.425
(107,128)	471	1.70	1.05	244:227	1.345	2.133*
(129,149)	467	0.42	-0.27	227:240	-0.284	0.739
(150,170)	450	1.01	1.11	238:212	1.246	2.545*
(171,191)	423	0.84	0.22	209:214	-0.002	1.034
(192,212)	409	0.65	0.85	190:219	0.82	-0.181
(213,233)	392	-0.66	-0.47	187:205	-0.524	0.319
(234,255)	367	-0.38	0.09	183:184	0.112	1.137
(2,128)	515	-0.22	-1.53	258:257	-0.792	1.454
(2,255)	515	1.48	0.01	262:253	-0.169	1.807

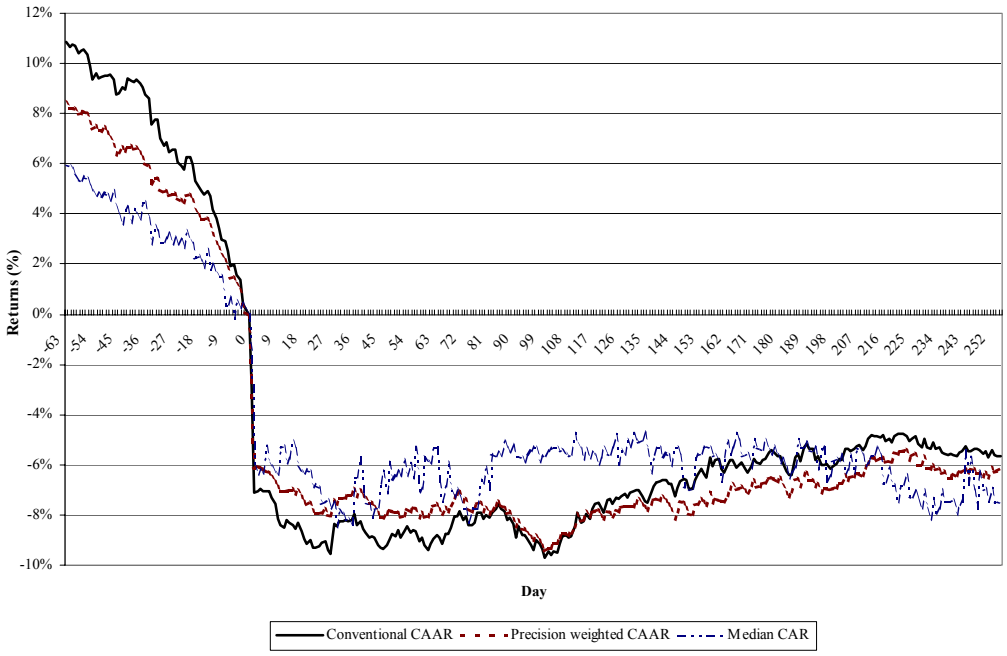
CAR = the sum of abnormal returns in a period.
Obs = the number of sample firms.
Positive = the number of sample firms with positive CAR.
Negative = the number of sample firms with negative CAR.
* = statistical significance at 5% using a 2-tail test.

BHAR Approach

The measure of abnormal performance in the BHAR approach is the average BHAR. First, for each restating firm, the monthly return is calculated by compounding the daily returns in that month; then these monthly returns are compounded to calculate the six-month or one-year buy-and-hold returns (BHRs). By compounding the monthly returns rather than directly compounding all the daily returns in the holding period, we alleviate the bad model problem. Each restating firm's BHAR is the difference between its BHR and the equal weighted CRSP market index within the holding period. The cross-sectional test is performed to test the significance of the six-month or one-year BHAR. To alleviate the misspecification problem in using daily returns, the average abnormal returns of each month and the holding period are tested using the bootstrapped

approach along with the skewness-adjusted t test. If a firm is delisted within the holding period, it is assumed that the stock is sold at the end of the last trading day and the proceeds are reinvested in the rest of the stocks in the portfolio equally in the next trading day.

Figure 1: Cumulative Abnormal Returns of Restating Firms



BHAR's of restating firms calculated by compounding monthly returns data are presented in the Panel A of Table 5. The results show that restating firms have significantly negative abnormal returns of 9.97 percent and 16.93 percent in the six-month and one-year post-announcement periods, respectively. This indicates that the restating firms' stocks under-perform the market over the six month period and one year period following the announcement of earnings restatements, inconsistent with the efficient market hypothesis.

BHAR's calculated by compounding daily returns with bootstrapped approach are presented in Panel B of Table 5.[3] Mean BHAR's over the six month and the one year periods are -16.39% and -64.03%, respectively, both of which are statistically significant. This also indicates that the restating firms' stocks under-perform the market over the holding periods, consistent with the under-reaction hypothesis but not with the efficient market hypothesis. Restating firms under-perform the market by 3.16 % in the first month on average. The generalized sign test shows that there are significantly more restating firms with negative BHAR than restating firms with positive BHAR over the six month and the one year holding periods. This may also implies that restating firms under-perform the market over the holding periods, inconsistent with the efficient hypothesis.

The six-month and one-year BHAR's in Panel B are much more negative than those in Panel A, which may support the notion that misspecification problem can be more severe when compounding daily returns than compounding monthly returns.

Table 5: Buy-and-Hold Abnormal Returns of Restating Firms

Panel A. BHAR calculated by compounding monthly returns

Holding Period	N	Mean BHAR (%)	Median BHAR (%)	Positive:Negative	t-stat	
6-month	517	-9.97	-14.62	208:309	-4.86**	
1-year	517	-16.93	-24.58	206:311	-4.32**	

Panel B. BHAR calculated by compounding daily returns

Holding Period	N	Mean BHAR (%)	Median BHAR (%)	Positive:Negative	Generalized Sign z-stat	Skewness adj. t-stat
(2,22)	511	-3.16	-2.53	203:308	-3.259**	-3.137**
(23,43)	510	-1.37	-1.88	218:292	-1.889	-1.206
(44,64)	496	-0.62	-1.58	216:280	-1.505	-0.563
(65,85)	489	-0.18	-0.90	233:256	0.323	-0.188
(86,106)	482	-2.07	-4.17	190:292	-3.300**	-1.913
(107,128)	472	0.38	-0.48	229:243	0.695	0.337
(129,149)	467	0.27	-2.10	206:261	-1.216	0.245
(150,170)	450	0.26	-0.44	219:231	0.742	0.228
(171,191)	423	-1.19	-1.68	185:238	-1.313	-1.034
(192,212)	409	-0.49	-2.28	173:236	-1.873	-0.435
(213,233)	392	-1.49	-2.54	172:220	-1.207	-1.186
(234,255)	367	-1.13	-1.65	171:196	-0.125	-0.869
(2,128)	516	-16.39	-12.40	190:326	-4.597**	-6.046**
(2,255)	516	-64.03	-21.51	192:324	-4.420**	-6.673**

BHAR = the buy-and-hold return differential between the restating firm and the equally weighted CRSP market index.
*, ** = statistical significance at 5% & 1%, respectively using a 2-tail test.

In sum, results from BHAR approach presented in Table 5 suggest that restating firms under-perform the market over the six month period and the one year period following the announcements of earnings restatements, consistent with the under reaction hypothesis but not with the efficient market hypothesis. However, it is premature to draw any inferences or make any conclusion based these results, because the effects of firm specific characteristics on stock returns are not controlled for in this BHAR Approach. Considering various firm characteristics of sample restating firms such as BM ratio, market value, and momentum shown in Table 1, it is necessary to control over these firm characteristics to obtain more meaningful and reliable test statistics.

For this control purpose, the BHAR approach with the control firm method advocated by Barber and Lyon (1997) is adopted in this study. Under this method, the BHAR of each restating firm is defined as:

$$BHAR_{j,1,T} = \prod_{t=1}^{T}(1+R_{jt}) - \prod_{t=1}^{T}(1+R_{ct})$$

Where R_{jt} and R_{ct} are the returns of sample firm j and its control firm, respectively, in month t; T denotes the number of month and is equal to 6 or 12 depending on the length of the holding period. The average BHAR is defined as:

$$AHAR_T = \frac{1}{n}\sum_{i=1}^{n} BHAR_{iT} \quad (1)$$

Where n is the number of firms in the buy-and-hold portfolio. The t-statistic is computed as the AHAR divided by the estimated standard error of AHAR.

We modify the methods used by Lyon, et al (1999) and Desai et al. (2002) to identify a size-, BM ratio-, and momentum- matched control firm for each sample firm. The control firms are required to be selling above one dollar and remain listed within the (0, 20) event date window. For each restating firm, we identify all the non-restating firms with market value and BM ratio between 70 percent and 130 percent of those of the restating firm at the end of the month when restatement is announced. We do not match the value at the beginning of the event month since the market is more likely to accept the price after the restatement as reference than the price before. From this set of firms, the non-restating firm that has past one-year returns closest to that of the restating firm is selected as the control firm.

BHR's of the restating firms, those of the control firms, and the difference between the two are presented in Table 6. Average BHAR, the excess of BHR's of restating firms over those of the matching non-restating firms, are not significant in any single month and holding period following the announcement of earnings restatements. This indicates that restating firms do not significantly under-perform their size-, BM ratio-, and momentum- matched control firms in either the six-month period or one-year holding period. In other words, there are no abnormal stock returns of restating firms after controlling for the firm characteristics over the post announcement holding period, consistent with the efficient market hypothesis. This may also imply that the results presented in Table 5 may be contaminated by the firm characteristics.

Table 6.: Buy-and-Hold Returns of the Restating Firms and Control Firms

Holding Period	N	Sample Firms			Control Firms			AHAR	t-stat
		Mean BHR (%)	Median BHR (%)	t-stat	Mean BHR (%)	Median BHR (%)	t-stat		
1st month	459	-1.98	-1.53	-1.75	-1.74	-1.50	-1.97	-0.40	-0.97
2nd month	456	-0.25	-0.78	-0.20	0.46	-0.42	0.45	-0.45	-0.17
3rd month	447	2.09	0.07	1.69	0.43	0.00	0.49	0.73	-0.74
4th month	443	-0.20	-0.95	-0.19	1.92	-1.11	1.26	-1.08	0.16
5th month	438	-0.17	-1.69	-0.14	-0.34	0.16	-0.36	-0.34	-0.34

Table 6.: Buy-and-Hold Returns of the Restating Firms and Control Firms

Holding Period	N	Sample Firms			Control Firms			AHAR	t-stat
		Mean BHR (%)	Median BHR (%)	t-stat	Mean BHR (%)	Median BHR (%)	t-stat		
6th month	432	1.42	0.00	1.15	0.18	-0.48	0.20	1.78	1.14
7th month	429	-1.08	-2.03	-0.96	-0.51	-0.48	-0.56	-0.83	-1.31
8th month	413	0.93	0.00	0.76	2.75	0.23	2.28	-1.15	-0.42
9th month	386	0.67	0.00	0.58	1.25	0.00	1.14	-0.15	0.00
10th month	373	1.45	-0.02	1.25	3.10	0.75	2.56*	-1.44	-0.68
11th month	359	0.76	-0.63	0.56	1.16	-0.05	0.82	0.79	0.00
12th month	337	0.10	-0.89	0.07	2.81	0.50	2.05	-1.65	-1.79
6-month	459	-1.09	-3.98	-0.41	0.13	-3.15	0.04	0.00	0.00
1-year	459	4.51	-6.38	1.07	16.40	0.89	2.99*	-7.11	-1.03

BHR = the buy and hold returns.
AHAR is the average BHAR of the sample firms.
BHAR = the buy-and-hold return differential between the restating firm and its control firm.
* = statistical significance at 5% using a 2-tail test.

Putting together, the results from Table 5 and Table 6 suggest that although restating firms underperform the market, the underperformance may be due to their firm characteristics, such as the size, BM ratio, and momentum, rather than earnings restatement. After controlling for these firm specific characteristics, there are no significant abnormal returns of restating firms, which supports the efficient market hypothesis.

Calendar-Time Portfolio Approach

We use the calendar-time portfolio approach advocated by Desai et al. (2002). To measure abnormal returns over the one year holding period after earnings restatements, at the beginning of each month from June 1997 through December 2002, a portfolio of firms that announced restatement during the past 1 year is formed. The portfolios in June 1997 and December 2002 include 14 and 84 stocks, respectively, compared with the median (mean) of 61 (59) for the whole period. The portfolio return is then regressed on the Fama and French's (1993) three factors and the momentum factor suggested by Carhart (1997). To allow for heteroskedasticity, the regression is run with the Weighted Least Square (WLS) technique using the number of stocks in the portfolio as the weight. The model can be expressed as follow,

$$PRET_t = \alpha + \beta_1 MRET_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOMT_t + \epsilon_t \qquad (2)$$

where $PRET_t$ is the monthly portfolio return of restating firms in excess of the one-month risk-free rate (proxied by one-month Treasury bill rate); $MRET_t$ is the excess return on a broad market portfolio; SMB_t is

the return differential between a portfolio of small stocks and a portfolio of large stocks; HML_t is the return differential between a portfolio of high BM ratio stocks and a portfolio of low BM ratio stocks; $MOMT_t$, a measure of momentum, is the return differential between a portfolio with high returns in the past one year and a portfolio of stocks with low returns in the past one year. The breakpoint for size portfolios is the median of NYSE market equity. The breakpoints for BM ratio and momentum portfolios are the 30th and 70th percentiles of NYSE stocks.

To measure the abnormal return over the six months following earnings restatement, the portfolio is formed in a slightly different way. That is, at the beginning of each month firms that announced earnings restatement during the past six months are selected to form the portfolio. To reduce the problem caused by small number of stocks in the portfolios at the beginning and the end of the sample period, the portfolio is formed from April 1997 through September 2002.

Since the calendar-time portfolio approach equally weighs each month, if the stock price performance in periods of high activity is different from that in periods of low activity, the regression method will average out the differences, making the approach less likely to detect abnormal performance (Loughran and Ritter, 2000). We perform two types of robust checks. First, the post-announcement performance in a period when the market is going up might be different from that in a period of market collapse. We rerun the regressions in two subsample periods divided at March 2000, an inflection point where the S&P 500 index turns from gaining to losing. The second robust check is on whether the performance varies in heavy- and low- earnings restatement periods. The reason for the performance differential is that high frequency of earnings restatement might be driven by problems widely existing in the industry, causing the stock prices to drop more in the period following heavy restatement announcements. Two dummy variables, LOW and HIG, are used to measure the frequency of earnings restatements. The frequency of earnings restatement is calculated by dividing the number of restating firms in the calendar-time portfolio each month by the total number of firms having return data in the CRSP in that month. HIG is equal to 1 if the frequency in that month lies above the 70^{th} percentile in all the monthly activities and zero otherwise; while LOW is equal to 1 if the frequency is below 30^{th} percentile of all monthly activities and zero otherwise. Since the small number of stocks included in the portfolio at the beginning and the end of the sample period is driven mainly by the short period of restatement records, we set LOW to be equal to 0 for the 1-year holding portfolios in the June 1997 – December 1997 and August 2002 – December 2002 periods. For the 6-month holding portfolios, LOW is equal to 0 in the April 1997 – June 1997 and August 2002 – September 2002 periods. A regression model incorporating HIG and LOW can be described as follow,

$$PRET_t = \alpha + \beta_1 MRET_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOMT_t + \beta_5 HIG_t + \beta_6 LOW_t + \epsilon_t \qquad (3)$$

Results from the time calendar portfolio approach are shown in Table 7. Panel A and Panel B present the stock price performance of restating firms over the one year and the six months holding periods following earnings restatement, respectively. The intercepts from regression models (2) and (3), measures of abnormal stock returns, are 0.881 and 0.191, respectively over the one year holding period, while those from regression models (2) and (3) are 1.120 and 1.985, respectively over six month holding period. None of these intercept values are significant, suggesting that restating firms do not have abnormal return after controlling for market excess returns, size, BM ratio, the momentum, and/or the frequency of earnings restatements. Moreover, regression coefficients of the two dummy variables, HIG and LOW, are not significant in any regression,

suggesting that the frequency of earnings restatement does not have material impact on the post-announcement stock price performance of restating firms and the failure to detect abnormal returns is not due to averaging between months with more restatements and months with fewer restatements.

Results from the regression tests on two sub periods (i.e., before April 1, 2000 (bull market) and after April 1, 2000 (bear market)) are presented in Panels C and D of Table 7. Test results on the one year holding period are reported in Panel C, while those on the six month holding period are in panel D. The results show no material difference in the stock price performance between the two periods and the intercept terms for the both sub periods and holdings periods remain insignificant, suggesting that the previous regression results are not influenced by variation in the market conditions and restating firms do not have abnormal return after controlling for market, excess returns, size, BM ratio, the momentum, and/or the frequency of earnings restatements.

The adjusted R^2 of the eight regressions in Table 7 varies from 0.67 to 0.83, suggesting that the four return generating factors, especially the market excess return, the size, and momentum factors, explain a large portion of the variance of the stock returns of the restating firms. Market excess return is a significant explanatory variable in all the regressions. The market β is smaller than one in five of the eight regressions, suggesting that stock price of the restating firms is no more volatile than the market. The size factor is significantly and positively correlated with the excess returns of the restating firms in all the regressions, suggesting that restating firms perform well when small stocks perform well. The coefficient of the BM ratio factor is significant in only 2 of the 8 regressions. This result is in line with the finding that restating firms do not significantly differ from the other firms in BM ratio. The coefficient of the momentum factor is negative in all the regressions and is significant in 6 of the 8 regressions. This result is consistent with the fact that restating firms experience negative price drift before earnings restatement and suggests that part of the underperformance following earnings restatement is due to momentum.

Table 7: Equal Weighted Calendar Time Portfolio Abnormal Returns

$$PRET_t = \alpha + \beta_1 MRET_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOMT_t + \epsilon_t \quad (2)$$

$$PRET_t = \alpha + \beta_1 MRET_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOMT_t + \beta_5 HIG_t + \beta_6 LOW_t + \epsilon_t \quad (3)$$

Panel A. 1-year post-announcement performance

	Intercept	MKRET	SMB	HML	MOMT	HIG	LOW	Adj. R^2
(2)	0.881 (1.57)	0.989 (7.67**)	0.825 (6.67**)	0.087 (0.54)	-0.425 (-5.24)			0.765
(3)	0.191 (0.24)	1.018 (7.86**)	0.787 (5.97**)	0.062 (0.37)	-0.417 (-5.16**)	2.060 (1.65)	0.265 (0.18)	0.768

Panel B. 6-month post-announcement performance

	Intercept	MKRET	SMB	HML	MOMT	HIG	LOW	Adj. R^2
(2)	1.120 (1.63)	0.878 (5.55**)	0.756 (5.09**)	-0.127 (-0.65)	-0.514 (-5.04**)			0.692
(3)	1.985 (1.95)	0.898 (5.62**)	0.716 (4.69**)	-0.154 (-0.78)	-0.507 (-4.96**)	-0.743 (-0.48)	-2.407 (-1.46)	0.693

Table 7: Equal Weighted Calendar Time Portfolio Abnormal Returns

$$PRET_t = \alpha + \beta_1 MRET_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOMT_t + \epsilon_t \quad (2)$$

$$PRET_t = \alpha + \beta_1 MRET_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOMT_t + \beta_5 HIG_t + \beta_6 LOW_t + \epsilon_t \quad (3)$$

Panel C. 1-year post-announcement performance

Period	Intercept	MKRET	SMB	HML	MOMT	Adj. R^2
06/1997–03/2000	0.469 (0.56)	0.680 (3.64**)	0.795 (4.49**)	-0.821 (-2.30*)	-0.798 (-3.86**)	0.729
04/2000–12/2002	1.323 (1.69)	1.186 (6.99**)	0.716 (4.39**)	0.236 (1.23)	-0.376 (-3.97**)	0.830

Panel D. 6-month post-announcement performance

Period	Intercept	MKRET	SMB	HML	MOMT	Adj. R^2
04/1997–03/2000	1.217 (1.34)	0.475 (2.28*)	0.733 (3.79**)	-0.985 (-2.53*)	-0.876 (-4.17**)	0.670
04/2000–08/2002	0.761 (0.73)	1.204 (5.45**)	0.701 (3.30**)	0.182 (0.73)	-0.452 (-3.63)	0.767

PRET = the monthly portfolio return for restating firms in excess of the one-month risk-free rate (one-month Treasury bill rate).
MRET = the excess return on a broad market portfolio.
SMB = the return differential between a portfolio of small stocks and a portfolio of large stocks.
HML = the return differential between portfolio of high book-to-market ratio stocks and a portfolio of low book-to-market ratio stocks.
MOMT = the return differential between a portfolio with high returns in the past one year and a portfolio with low returns in the past one year.
HIG = a dummy variable for the frequency of earnings restatement. HIG is equal to 1 if the number of earnings restatement in that month lies above the seventieth percentile in all the monthly activities and zero otherwise.
LOW = a dummy variable for the frequency of earnings restatement. LOW is equal to 1 if the number of earnings restatement is below thirtieth percentile of all monthly activities and zero otherwise.
(.) = t-value.
*, ** = statistical significance at 5% and 1%, respectively.

CONCLUSIONS

We investigate the long-term stock performance of restating firms after the announcement of earnings restatements using three major approaches such as CAR, BHAR, and calendar time portfolio approaches in this study. All three approaches to measure long-term stock performance of restating firms show that there are no significant abnormal returns over the six month and the one year post announcement holding periods, supporting the efficient market hypothesis but not the under reaction hypothesis. The results are robust across different testing periods, investment holding periods, and methodologies. Our results are not consistent with those of the previous studies on this issue which exclusively used CAR approach to measure the long-term stock performance. As addressed before, the conventional CAR approach does not provide a precise picture

of long-term stock performance due to its embedded structural problem of simple summation of periodic abnormal returns rather than compounding of them and its cross-sectional dependence problem. These inconsistent results may be because we use different methodologies that mitigate or resolve misspecification problems in the previous studies.

ENDNOTES

[1] This study adopts the definition of accounting irregularity made by General Accounting Office (2002), i.e., it is "an instance in which a company restates its financial statements because they were not fairly presented in accordance with generally accepted accounting principles (GAAP). This would include material errors and fraud."

[2] Jegadeesh and Titman (1993) document that, on average, stocks that have high returns in the past three to twelve months continue to outperform stocks that have low returns in that period. This stock price continuation in the intermediate horizon is referred as momentum effect.

[3] Since results from the bootstrapped approach are very similar to those from the conventional method, results from the bootstrapped approach only are presented in Table 5.

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TRADING BELL AT THE NASDAQ

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ABSTRACT

Earlier research has shown that significant media events related to a stock generate investor reactions and hence tend to affect the stock price, usually on a very short-term basis. In this paper, we investigate the information content of the important media event of ringing of the trading bell at the NASDAQ. We picked a sample of 374 opening bell-ringing events during the years 2006 through 2008. We were careful to choose only those bell ringing events that were not in tandem with any concurring event of economic significance such as an IPO, a launch of a new product etc. We fit a standard market model and test for the presence of abnormal returns around the event date. The evidence suggests that ringing the trading bell at the NASDAQ is a non-event in terms of having effect on stock prices and hence the markets are efficient.

INTRODUCTION

The ringing of the trading bell signify the start of the NASDAQ's trading day, at 9:30 AM The trading bell is considered to be a part of the NASDAQ heritage and the ringing of the bell is an honor normally reserved for governmental officials, international dignitaries visiting the New York City, heads of listed companies and to celebrate certain special occasions related to New York. There has been some controversy regarding the selection process of the companies which are invited to ring the trading bell. NASDAQ states that the companies which are selected to ring the trading bell should have a minimum market capitalization of $500 m for the opening bell and $250 m for the closing bell but they have also exercised a waiver of these requirements many times in the past. There has also been some controversy regarding selection of some companies which had been undergoing investigation for fraud for example take the case of Take-Two Interactive, Inc., which rang the opening bell for Nasdaq on April 11 of last year. At the time of the bell ringing, Take-Two Interactive had already been named as the target of an accounting fraud probe by the SEC's enforcement division, and was trying to negotiate a settlement deal with the regulators. The NASDAQ's opening ceremonies are believed to be amongst the most widely viewed daily TV events in the world. Companies use this bell ringing event to celebrate various milestones. Numerous listed companies have used this event to launch their products and hence try to increase their visibility in the market. This public event is also used to celebrate launch of IPO, spin-offs, mergers, transfer of listing from a different exchange as NYSE or AMEX, name and ticker change of the company, retirement of a senior executive etc. The invitation to ring the trading bell is also, sometimes, extended to companies simply to mark anniversary of their listing on the NASDAQ or to mark an anniversary of the firm's incorporation.

This paper investigates whether media attention generated by the NASDAQ bell ringing event systematically affects stock prices. Now, normally, we would expect stock prices to react to important

economic events such as announcing of an IPO, spin-offs, mergers and acquisitions, launch of a new product, transfer from another exchange and hence we would expect any stock price reaction around the event date to be a result of these events rather than the due to the media attention generated by the bell ringing event itself. So to isolate the effect of the bell ringing event itself. we investigate the stock price reaction only for those firms that were invited to ring the opening or closing bell to celebrate what we consider to be "economically insignificant events" such as celebrating the anniversary of listing or incorporation, name or ticker change, or simply a NASDAQ visit etc. The evidence seems to suggest that media attention generated from this trading bell-ringing event doesn't systematically affect stock prices. The paper proceeds as follows. In section 2 we review some earlier papers related to this research area, in section 3 we discuss the sample selection process, in section 4 we discuss the empirical model, in section 5 we discuss the implications of the results and in section 6 we conclude.

LITERATURE REVIEW

There are various interesting investor recognition theories in the finance literature that connects stock price reaction to these kinds of media events. Merton (1987, p. 503) notes that "media coverage, public relations and other investor marketing activities could play an important causal role in creating and sustaining speculative bubbles and fads among investors." In an interesting study recently, Meshke (2002) examined the price and volume reactions to CEO interviews broadcast on CNBC and found a significant mean price increase of 1.65 percent accompanied by higher trading volume on the day of the interview and strong mean reversion in prices of minus 2.78 percent during the ten trading days following the interview. He attributes this finding to the extensive media attention that a CNBC interview generates. In an earlier paper, we have examined the stock price reaction to the bell-ringing event at the NYSE (Sengupta, 2007).

SAMPLE SELECTION

Using the NASDAQ website, we select a sample of 374 opening bell ringing events in the calendar years 2006, 2007 and 2008. These events are, what we define to be of "no economic significance." In our sample, such events belong to the following categories: a simple NASDAQ visit, a recent name or ticker change, celebrating an anniversary of listing, celebrating an anniversary of incorporation, and a miscellaneous category that exhausts all other economically insignificant events associated with this bell-ringing event. Table 1 in the appendix exhibits the sample of firms and event dates. We thought our sample of 374 events is a good sized sample and is sufficiently big to study the impact of this event, if any.

EMPIRICAL MODEL

This study employs a standard event study methodology and we fit a standard market model to measure normal performance:

$$R_{it} = \alpha_I + \beta_I R_{mt} + \varepsilon_{it}, \quad \text{where } E(\varepsilon_{it}) = 0 \text{ and } var(\varepsilon_{it}) = \sigma^2_{et} \qquad (1)$$

Each sample calendar date is converted to event time by defining the date of the bell ringing event date as event date 0. So for a morning bell ringing event, event date 0 is the same trading day. For a closing bell ringing event, event date 0 is the following trading day. The regression coefficients α_i and β_i are estimated in an ordinary least squares (OLS) regression during the estimation period one year (255 trading days) prior to the event period (event days -300 through -46). The event period consists of 61 trading days centered on the trading bell event (-30 through +30). We define four event windows based on the event date, [-30,-2], [-1, 0], [+1, +2] and [+3, +30]. As proxy for the return for the market portfolio R_{mt}, both the CRSP value weighted index and the CRSP equal weighted index are used.

Under standard assumptions, OLS is a consistent estimation procedure for the market model parameters. Under the assumption that asset returns are jointly multivariate normal and independently and identically distributed (iid), OLS is also efficient. The prediction errors, PE_{it}, which represent abnormal returns, are simply the OLS residuals, $\hat{\varepsilon}_{it}$.

$$PE_{i\tau} \equiv \hat{\varepsilon}_{i\tau} = R_{i\tau} - (\hat{\alpha}_i + \hat{\beta}_i R_{m\tau}) \tag{2}$$

with

$$\hat{\sigma}^2_{\varepsilon i} = \frac{1}{255-2} \sum_{\tau=t-299}^{t-46} (R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau})^2 \tag{3}$$

The prediction error, PE_{it} is used as an estimator of the abnormal return. In other words, the abnormal return is the residual term of the market model calculated on an out of sample basis. Let $AR_{i\tau}$, τ = t-30, t-29,....t+29, t+30be the sample of 61 abnormal returns for firm i in the event window. Under the null hypothesis, conditional on the event window market returns, the abnormal returns will be jointly normally distributed with a zero conditional mean and conditional variance:

$$AR_{i\tau} \sim N(0, \sigma^2(AR_{i\tau}))$$

The conditional variance $\sigma^2(AR_{it})$has two components. The first component is the disturbance $\hat{\sigma}_{\varepsilon i}$ from (3), and the second component is additional variance due to sampling error in estimating the market model parameters α_i and β_i:

$$\sigma^2(AR_{it}) = \sigma^2_{\varepsilon\tau} + \frac{1}{255}\left[1 + \frac{(R_{m\tau} - \bar{R}_m)^2}{\hat{\sigma}^2_m}\right] \text{ where } \bar{R}_m = \frac{1}{255} \sum_{\tau=t-299}^{t-46} R_{m\tau}$$

Since the estimation window is large (255 trading days), I assume that the contribution of the second component to $\sigma^2(AR_{it}$ is zero.

To draw inferences about the average price impact of an event, abnormal return observations have to be aggregated across securities and through time. Average abnormal returns AAR_τ are formed by aggregating abnormal returns $AR_{i\tau}$ for each event period τ= t-30,t-29,...t+29, t+30.. Given N events (for our sample, N = 147),

$$AAR_\tau = \frac{1}{N}\sum_{i=1}^{N} AR_{i\tau}$$

Under the assumption that average abnormal returns are independent across securities, the asymptotic variance equals to

$$Var(AAR_\tau) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma_{\varepsilon\tau}^2$$

The average abnormal returns are aggregated through time to give the cumulative average abnormal return,

$$CAAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AAR_{i\tau}$$

Setting the covariance terms to be zero,

$$\text{var}(CAAR_i(\tau_1, \tau_2)) = \sum_{i=1}^{N} \text{var}(AAR_{i\tau})$$

Hence $CAAR_i(\tau_1, \tau_2) \sim N(0, \text{var}(CAAR_i(\tau_1, \tau_2))$

This can be used to test the null hypothesis that the abnormal returns are zero.

Because $\sigma^2_{\varepsilon\tau}$ is unknown, it has to be estimated, Since on a single day there are two trading bell ringing events involving two firms, it is quite likely that abnormal returns are cross-sectionally correlated across securities. Hence using $\hat{\sigma}^2_{\varepsilon\tau}$ in (7) to construct test statistics could cause a potential problem. Brown and Werner (1985) suggest a 'crude dependence adjustment' which uses the variance of portfolio residuals from the estimation period rather than the sum of variances of residuals for individual securities. Therefore the estimated variance of AAR_τ is

$$\hat{\sigma}^2_{AAR} = \frac{\sum_{\tau=t-299}^{t-46} (AAR_\tau - \overline{AAR})^2}{255-2} \quad \text{where } \overline{AAR} = \frac{\sum_{\tau=t-299}^{t-46} AAR_\tau}{255}$$

The portfolio test statistic for day τ in event time is

$$t = \frac{AAR_\tau}{\hat{\sigma}_{AAR}}$$

Assuming time series independence, the test statistic for $CAAR_i(\tau_1 \tau_2)$ is

$$t = \frac{CAAR_i(\tau_1, \tau_2)}{\sqrt{(\tau_2 - \tau_1 + 1)}\hat{\sigma}_{AAR}}$$

If clustering is present, this portfolio approach will impound any residual cross-sectional correlation in its estimate of portfolio residual's standard deviation. Nevertheless, besides being cross-sectionally correlated, the abnormal return estimators often have different variances across firms. A common way of addressing this problem is the standardized residual method (Patell, 1976). Define the *standardized abnormal return*, $SAR_{i\tau}$ as

$$SAR_{i\tau} = \frac{AR_{i\tau}}{\hat{\sigma}_{MLE_{i\tau}}}$$

Where

$$\hat{\sigma}_{MLE_{i\tau}} = \hat{\sigma}^2_{\varepsilon\tau}\left(1 + \frac{1}{T} + \frac{(R_{m\tau} - \bar{R}_m)^2}{\sum_{\tau=t-299}^{t-46}(R_{m\tau} - \bar{R}_m)^2}\right)$$

is the maximum likelihood estimate of the variance. Under the null hypothesis each $SAR_{i\tau}$ follows a Student's t distribution with T-2 degrees of freedom. Summing the $SAR_{i\tau}$ across the sample yields

$$ASAR_{i\tau} = \sum_{i=1}^{N} SAR_{i\tau} \text{ where } ASAR_{i\tau} \sim N(0, Q_\tau)$$

The Z-test statistic for the null hypothesis that $CAAR_i\ (\tau_1, \tau_2) = 0$ is

$$Z(\tau_1, \tau_2) = \frac{1}{\sqrt{N}}\sum_{i=1}^{N} Z_i(\tau_1, \tau_2) \text{ where } Z_i(\tau_1, \tau_2) = \frac{1}{\sqrt{(\tau_2 - \tau_1 + 1)\frac{T-2}{T-4}}}\sum_{\tau=\tau_1}^{\tau_2} SAR_{i\tau}$$

The two test statistics so far discussed use the variance estimate from the market model during the estimation period to estimate the variance of the abnormal return estimator. But frequently, events increase the variance of returns, so that the event period variance is greater than the estimation period variance. Two common proposals for coping with event-induced variance are the cross-sectional standard deviation method proposed by Brown and Warner (1985) and the standardized cross-sectional test developed by Boehmer, Musumeci and Poulson (1991). The cross-sectional standard deviation method substitutes a daily cross-sectional standard deviation for the portfolio time-series standard deviation. The portfolio test statistic for day t in event time is

$$t = \frac{AAR_\tau}{\hat{\sigma}_{AAR_\tau}/\sqrt{N}} \text{ where } \hat{\sigma}_{AAR_\tau} = \frac{1}{N-1}\sum_{i=1}^{N}(AR_{i\tau} - \frac{1}{N}\sum_{i=1}^{N}AR_{i\tau})^2$$

We use the above equation to calculate *Adjusted-t*

The *standardized cross-sectional method* is a hybrid of the standardized-residual and the cross-sectional approach:

$$Z_t = \frac{ASAR_\tau}{\hat{\sigma}_{SAR_\tau}/\sqrt{N}} \text{ where } \hat{\sigma}_{AAR_\tau} = \frac{1}{N-1}\sum_{i=1}^{N}(SAR_{i\tau} - \frac{1}{N}\sum_{i=1}^{N}SAR_{i\tau})^2$$

We use the above equation to calculate Adjusted-Z.

RESULTS AND EXPLANATION

Using a sample of 374 bell-ringing events from the calendar year 2006, 2007 and 2008 we fitted a standard market model and calculated the abnormal returns using the following four event windows: [-30,2], [-1,0], [0,+1], [+2,+5], {+6,+30]. We define the event date as being date 0. Our main event window of interest is {0,+1] since we expect any impact of the bell ringing event to be of extremely short duration and would be reflected in the stock prices only during the day of the event. The other event windows are put in place to capture any lagged effect or any run up to the event, if any such effect exists in our study. Using CRSP (Center for Research in Securities Prices) data and Eventus software available on the Wharton Research Database website, we found a negative 0.10 percent mean abnormal return for the window [0,+1] using equal weighted index as proxy for market portfolio return. There is a mean reversion of 0.17% percent over the next three days following the bell ringing event. When we use a value weighted index for market return the mean abnormal return is negative 0.02% percent in the event window [-1,0] and followed by a mean reversion of 0.30% None of these results are statistically significant at the 5% level as is evident from our p and z values. So the overall results seem to suggest no significant return around the event date. Now what do these results mean? These results indicate that the bell ringing event even though is a highly media friendly well publicized event and give the company a great deal of exposure to the potential investors, the investors do not react irrationally by starting to buy stocks in that company which is invited to ring the bell. This is perfectly understandable since the bell-ringing event itself does not conceivably add any value to the company's stock. So the evidence seems to suggest that investors look upon the bell ringing honor as just a non event and does not have any consistent psychological effect on their minds. Now how would these results change depending on the general market conditions? We strongly believe that since this study is a short-term impact study restricted to one single day of the bell-ringing event, the impact of general market conditions would not play a significant role as far as changing the results of our study. While investors do take long term investment decisions based on the condition of the economy, the short term buying spree based on a psychological effect of a media event are largely unsystematic in nature. It is precisely the presence or absence of this kind of impact that we were trying to pick up in our analysis. So even if we had tested a similar 3 yr sample in a period of market book like the 2000s we strongly believe the results would not be impacted. Besides, the

market model itself that we have used in this study already has built up in it all conditions related to the general conditions of the economy- this is the way WRDS software has constructed the market model in their EVENTUS software. The following tables summarizes our main results.

CONCLUSION

We started this paper with the empirical question whether the media event of ringing of the trading bell at the NASDAQ systematically affects stock prices. Using an event study methodology, CRSP daily returns data and a sample of 374 trading bell ringing events, we find no such evidence. However there is a caveat. It is our conjecture that the effect of any such price dynamics due to such media events, if present, might only be evident in analyses involving intra daily high frequency tick by tick data.

Table 1: Results - Equally Weighted Index			
Market Model, Equally Weighted Index			
Days	Mean Cumulative Abnormal Return	Patell z	p-value
(-30,-2)	0.29%	-0.849	0.1214
(-1,0)	-0.02%	0.263	0.1487
(0,+1)	-0.10%	-0.436	0.1351
(+2,+5)	0.17%	1.123	0.1973
(+6,+30)	-2.25%	-3.192	0.0027
Results - Value Weighted Index			
Market Model, Value Weighted Index			
Days	Mean Cumulative Abnormal Return	Patell z	p-value
(-30,-2)	1.53%	1.814	0.009
(-1,0)	0.05%	0.405	0.1968
(0,+1)	-0.02%	-0.149	0.2547
(+2,+5)	0.30%	1.327	0.2536
(+6,+30)	-1.11%	-2.173	0.0951

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Table 2: Sample

Firm	Ticker	Event Date	Firm	Ticker	Event Date
YRC Worldwide	YRCW	1/4/2006	Palm, Inc.	PALM	3/29/2006
Juniper Networks, Inc.	JNPR	1/18/2006	OSI Pharmaceuticals	OSIP	4/4/2006
GFI Group Inc.	GFIG	1/20/2006	Sirna Therapeutics, Inc.	RNAI	4/5/2006
Open Text Corporation	OTEX	1/23/2006	ANSYS, Inc.	ANSS	4/6/2006
optionsXpress Holdings	OXPS	1/24/2006	Parallel Petroleum Corporation	PLLL	4/10/2006
TD Ameritrade Holding Corporation	AMTD	1/25/2006	Universal Display Corporation	PANL	4/11/2006
Per-Se Technologies, Inc.	PSTI	1/27/2006	Petrohawk Energy Corporation	HAWK	4/12/2006
United Airlines	UAUA	2/2/2006	Magma Design Automation, Inc.	LAVA	4/17/2006
Diamond Foods, Inc.	DMND	2/3/2006	Cognos	COGN	4/18/2006
ATP Oil & Gas Corporation	ATPG	2/6/2006	Century Aluminum	CENX	4/19/2006
Elizabeth Arden, Inc.	RDEN ISCA	2/8/2006	Intergraph Corporation	INGR	4/20/2006
Hercules Offshore, Inc.	HERO	2/9/2006	First Cash Financial Services	FCFS	4/24/2006
Ceradyne, Inc.	CRDN	2/10/2006	Millennium Pharmaceuticals	MLNM	4/27/2006
Topps	TOPP	2/13/2006	Polycom, Inc.	PLCM	5/1/2006
Scholastic Corporation	SCHL	2/14/2006	Churchill Downs Incorporated	CHDN	5/2/2006
Dendrite International, Inc.	DRTE	2/16/2006	True Religion Apparel, Inc.	TRLG	5/4/2006
NICE Systems Ltd.	NICE	2/22/2006	1-800-FLOWERS.COM	FLWS	5/8/2006
Kearny Financial	KRNY	2/24/2006	Ceragon Networks Ltd.	CRNT	5/9/2006
Atheros Communications, Inc.	ATHR	2/27/2006	SanDisk Corporation	SNDK	5/10/2006
Cadence Design Systems, Inc.	CDNS	3/2/2006	AB Volvo	VOLV	5/11/2006
Jack Henry and Associates, Inc.	JKHY	3/3/2006	F5 Networks	FFIV	5/12/2006
Sun Microsystems, Inc.	SUNW	3/6/2006	Randgold Resources Limited	GOLD	5/15/2006
webMethods	WEBM	3/9/2006	Aladdin Knowledge Systems Ltd.	ALDN	5/16/2006
Sohu.com Inc.	SOHU	3/13/2006	Equinix Inc.	EQIX	5/18/2006
Sonus Networks, Inc.	SONS	3/14/2006	Biogen Idec	BIIB	5/19/2006
Trico Marine Services Inc.	TRMA	3/15/2006	Cytyc Corporation	CYTC	5/22/2006
Kelly Services, Inc.	KELYA	3/17/2006	Staples Inc.	SPLS	5/24/2006
Portfolio Recovery Associates, Inc.	PRAA	3/20/2006	Hansen Natural Corporation	HANS	5/26/2006
Gentiva Health Services, Inc.	GTIV	3/27/2006	National Instruments, Inc.	NATI	5/31/2006
Sears Holdings Corporation	SHLD	3/28/2006	First Financial	FFBC	6/1/2006
Linear Technology	LLTC	6/2/2006	Wright Medical Group, Inc.	WMGI	8/16/2006
Signature Bank	SBNY	6/7/2006	Ctrip.com International Ltd.	CTRP	8/18/2006
Advanced Digital Information Corp.	ADIC	6/12/2006	RARE Hospitality International, Inc	RARE	8/21/2006
Pacific Internet Ltd.	PCNTF	6/15/2006	BioCryst Pharmaceuticals, Inc	BCRX	8/22/2006
Synchronoss Technologies, Inc.	SNCR	6/16/2006	Caliper Life Sciences	CALP	8/23/2006
Blue Holdings, Inc. (BLUE)	BLUE	6/20/2006	Compass Diversified Trust	CODI	8/28/2006
Trans World Entertainment Corp.	TWMC	6/23/2006	Hancock Holding Company	HBHC	8/29/2006
inVentiv Health, Inc.	VTIV	6/26/2006	Respironics, Inc	RESP	8/30/2006

Table 2: Sample					
Firm	**Ticker**	**Event Date**	**Firm**	**Ticker**	**Event Date**
OraSure Technologies, Inc.	OSUR	6/27/2006	Cytogen Corporation	CYTO	9/1/2006
United Therapeutics Corporation	UTHR	6/28/2006	Telenor ASA	TELN	9/5/2006
QIAGEN N.V.	QGEN	6/29/2006	Global Industries, Ltd.	GLBL	9/7/2006
Option Care	OPTN	6/30/2006	Spanish Broadcasting System, Inc	SBSA	9/8/2006
APCO Argentina Inc.	APAGF	7/6/2006	Internet Security Systems Inc	ISSX	9/12/2006
BankFinancial Corporation	BFIN	7/11/2006	Ariba, Inc	ARBA	9/14/2006
Vertrue Incorporated	VTRU	7/12/2006	Scholastic Corporation	SCHL	9/15/2006
Rackable Systems, Inc	RACK	7/13/2006	Avocent Corporation	AVCT	9/18/2006
NBT Bancorp Inc	NBTB	7/14/2006	Cymer, Inc	CYMI	9/19/2006
United Fire & Casualty Compan	UFCS	7/17/2006	TriCo Bancshares	TCBK	9/21/2006
Brightpoint, Inc	CELL	7/18/2006	Virage Logic Corporation	VIRL	9/22/2006
Matthews International Corporation	MATW	7/20/2006	American Commercial Lines, Inc	ACLI	9/26/2006
Pegasus Wireless Corp	PGWC	7/21/2006	Quintana Maritime Limited	QMAR	9/28/2006
Infosys Technologies Ltd.	INFY	7/31/2006	Prosperity Bancshares, Inc	PRSP	10/2/2006
Max Re Capital Ltd	MSRE	8/1/2006	Given Imaging Ltd	GIVN	10/4/2006
Res-Care, Inc	RSCR	8/2/2006	Rediff.com India Limited	REDF	10/9/2006
Netgear Inc	NTGR	8/3/2006	Stewart Enterprises, Inc.	STEI	10/10/2006
Warren Resources, Inc	WRES	8/4/2006	Hibbett Sporting Goods	HIBB	10/11/2006
Color Kinetics Inc	CLRK	8/7/2006	Blackbaud, Inc	BLKB	10/13/2006
Newport Corporation	NEWP	8/15/2006	TALX Corporation	TALX	10/17/2006
Amylin Pharmaceuticals	AMLN	10/23/2006	Caribou Coffee Company, Inc.	CBOU	1/9/2007
Cubist Pharmaceuticals, Inc.	CBST	10/25/2006	Techwell, Inc.	TWLL	1/11/2007
ArthroCare Corporation	ARTC	10/27/2006	Digene Corporation	DIGE	1/12/2007
Cadence Design Systems, Inc	CDNS	11/1/2006	Whitney Holding Corporation	WTNY	1/17/2007
Flanders Corporation	FLDR	11/7/2006	Force Protection, Inc.	FRPT	1/18/2007
InterDigital Communications Corp.	IDCC	11/10/2006	NVIDIA Corporation	NVDA	1/23/2007
The Middleby Corporation	MIDD	11/13/2006	Citizens Republic Bancorp	CRBC	1/24/2007
PolyMedica Corporation	PLMD	11/14/2006	Oracle	ORCL	1/31/2007
Astec Industries, Inc	ASTE	11/16/2006	Diamond Foods, Inc.	DMND	2/1/2007
Steiner Leisure Limited	STNR	11/17/2006	Ameristar Casinos, Inc.	ASCA	2/2/2007
Blue Nile, Inc.	NILE	11/27/2006	Epiq Systems, Inc.	EPIQ	2/5/2007
Physicians Formula Holdings, In	FACE	11/28/2006	First Busey Corporation	BUSE	2/6/2007
Ohio Casualty Corporation	OCAS	11/29/2006	Altus Pharmaceuticals Inc.	ALTU	2/7/2007
Gilead Sciences	GILD	12/1/2006	EMC Insurance Group Inc.	EMCI	2/9/2007
Centennial Communications	CYCL	12/4/2006	Silgan Holdings	SLGN	2/13/2007
Exelixis, Inc.	EXEL	12/5/2006	Scholastic Corporation	SCHL	2/14/2007
Powerwave Technologies, Inc.	PWAV	12/6/2006	E*TRADE FINANCIAL Corporation	ETFC	2/20/2007
PSS World Medical, Inc.	PSSI	12/7/2006	Teva Pharmaceutical Industries, Ltd.	TEVA	2/21/2007
Schnitzer Steel Industries, Inc.	SCHN	12/8/2006	Internap Network Services Corporation	INAP	2/23/2007
Insight Enterprises, Inc.	NSIT	12/11/2006	Sterling Financial Corporation	STSA	2/26/2007

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Firm	**Ticker**	**Event Date**	**Firm**	**Ticker**	**Event Date**
Adaptec, Inc.	ADPT	12/13/2006	Millicom International Cellular S.A.	MICC	2/27/2007
NAPCO Security Systems, Inc.	NSSC	12/14/2006	Intersil Corporation	ISIL	2/28/2007
Perrigo Company	PRGO	12/18/2006	Cognizant Technology Solutions Corp.	CTSH	3/5/2007
Rambus Inc.	RMBS	12/20/2006	Sonic Foundry, Inc.	SOFO	3/7/2007
Progress Software Corporation	PRGS	12/27/2006	Harbin Electric, Inc.	HRBN	3/8/2007
The Exploration Company	TXCO	1/8/2007	Harris Interactive, Inc.	HPOL	3/13/2007
Kelly Services, Inc.	KELYA	3/16/2007	PAREXEL International Corporation	PRXL	6/6/2007
Summer Infant, Inc.	SUMR	3/20/2007	Popular, Inc.	BPOP	6/11/2007
American Woodmark Corporation	AMWD	3/23/2007	Cutera, Inc.	CUTR	6/12/2007
Medical Action Industries Inc.	MDCI	4/2/2007	Synaptics Incorporated	SYNA	6/13/2007
Switch & Data Facilities Company, Inc.	SDXC	4/10/2007	Tessera Technologies, Inc.	TSRA	6/14/2007
Omni Financial Services, Inc.	OFSI	4/16/2007	Web.com	WWWW	6/15/2007
JA Solar Holdings, Co.	JASO	4/19/2007	Psychiatric Solutions, Inc.	PSYS	6/19/2007
Datascope Corp.	DSCP	4/20/2007	OceanFreight, Inc.	OCNF	6/20/2007
Staples, Inc.	SPLS	4/24/2007	ShengdaTech, Inc.	SDTH	6/21/2007
Churchill Downs Incorporated	CHDN	4/25/2007	United Stationers Inc.	USTR	6/22/2007
BreitBurn Energy Partners, L.P.	BBEP	4/26/2007	Pinnacle Financial Partners, Inc.	PNFP	6/25/2007
Autodesk, Inc.	ADSK	4/27/2007	OraSure Technologies, Inc.	OSUR	6/27/2007
ILOG S.A.	ILOG	4/30/2007	BlackRock Kelso Capital Corporation	BKCC	6/29/2007
Riverbed Technology, Inc.	RVBD	5/7/2007	Greenfield Online, I	SRVY	7/3/2007
1-800 Flowers.Com, Inc.	FLWS	5/8/2007	Nathan's Famous, Inc.	NATH	7/5/2007
Huron Consulting Group	HURN	5/9/2007	iPCS, Inc.	IPCS	7/10/2007
Integrated Device Technology, Inc.	IDTI	5/11/2007	Legacy Bancorp, Inc	LEGC	7/16/2007
BOK Financial Corporation	BOKF	5/15/2007	ZOLL Medical Corporation	ZOLL	7/17/2007
Kyphon Inc.	KYPH	5/17/2007	Limco-Piedmont Inc	LIMC	7/19/2007
ViroPharma Incorporated	VPHM	5/18/2007	TASER International, Inc	TASR	7/23/2007
Claymont Steel Holdings	PLTE	5/24/2007	CONMED Corp	CNMD	7/24/2007
STARLIMS Technology	LIMS	5/25/2007	TiVo Inc	TIVO	7/25/2007
United Bankshares, Inc.	UBSI	5/29/2007	Mellanox Technologies, Ltd	MLNX	7/30/2007
Super Micro Computer	SMCI	5/30/2007	Hi-Tech Pharmacal Co., Inc	HITK	8/3/2007
InfoSonics Corp.	IFON	5/31/2007	Shore Financial Corporation	SHBK	8/7/2007
Lawson Software, Inc	LWSN	8/8/2007	Ulta Salon, Cosmetics & Fragrance, Inc	ULTA	10/25/2007
Linn Energy	LINE	8/9/2007	PCTEL, Inc	PCTI	10/26/2007
Akorn Inc.	AKRX	8/13/2007	Aftermarket Technology Corp	ATAC	10/30/2007
InnerWorkings, Inc	INWK	8/16/2007	Logitech International S.A.	LOGI	11/1/2007
Chordiant Software, Inc	CHRD	8/17/2007	Shire plc	SHPGY	11/2/2007
Kendle International Inc.	KNDL	8/22/2007	Infinera Corporation	INFN	11/6/2007
PowerSecure International, Inc	POWR	8/23/2007	CoStar Group, Inc	CSGP	11/8/2007
CastlePoint Holdings, Ltd	CPHL	8/27/2007	ON Semiconductor Corporation	ONNN	11/9/2007
Symantec Corporation	SYMC	8/28/2007	Silicon Image, Inc	SIMG	11/12/2007

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Firm	**Ticker**	**Event Date**	**Firm**	**Ticker**	**Event Date**
American Capital Strategies, Ltd	ACAS	8/29/2007	VeriSign, Inc	VRSN	11/15/2007
Legacy Reserves LP	LGCY	8/30/2007	RF Micro Devices, Inc	RFMD	11/16/2007
ANADIGICS, Inc	ANAD	8/31/2007	Progenics Pharmaceuticals Inc.	PGNX	11/19/2007
GTx, Inc	GTXI	9/4/2007	YRC Worldwide, Inc	YRCW	11/23/2007
Patterson-UTI Energy, Inc	PTEN	9/5/2007	Invitrogen Corporation	IVGN	11/26/2007
Global Industries, Ltd.	GLBL	9/6/2007	Molex Incorporated	MOLXA	11/27/2007
Global Sources Ltd	GSOL	9/7/2007	Fastenal Company	FAST	11/28/2007
Arena Pharmaceuticals, Inc.	ARNA	9/12/2007	Mercantile Bank Corp	MBWM	12/6/2007
CDC Corporation	CHINA	9/13/2007	Dionex Corp	DNEX	12/7/2007
Littelfuse, Inc	LFUS	9/14/2007	Thomas Properties Group Inc	TPGI	12/10/2007
Ultratech, Inc.	UTEK	9/18/2007	Copart Inc	CPRT	12/11/2007
Magellan Health Services, Inc.	MGLN	9/20/2007	Insight Enterprises	NSIT	12/12/2007
Cent. European Media Enterprises Ltd.	CETV	9/24/2007	Wind River Systems	WIND	12/18/2007
Ligand Pharmaceuticals Incorporated	LGND	9/26/2007	ZipRealty, Inc	ZIPR	12/21/2007
Syntel, Inc	SYNT	9/28/2007	Power Integrations, Inc	POWI	12/21/2007
ICF International, Inc.	ICFI	10/1/2007	Progress Software	PRGS	12/27/2007
Hologic, Inc	HOLX	10/2/2007	Esmark Incorporated	ESMK	12/31/2007
II-VI Incorporated	IIVI	10/5/2007	Heritage Financial Corporation	HFWA	1/8/2008
Partner Communications Company Ltd	PTNR	10/8/2007	Eagle Rock Energy Partners L.P.	EROC	1/10/2008
Allscripts Healthcare Solutions Inc.	MDRX	10/10/2007	Oracle Inc	ORCL	1/14/2008
Smurfit-Stone Container Corporation	SSCC	10/11/2007	Applied Materials, Inc.	AMAT	1/17/2008
Blue Coat Systems Inc	BCSI	10/12/2007	HSW International Inc.	HSWI	1/22/2008
Sirtris Pharmaceuticals, Inc.	SIRT	10/16/2007	IPG Photonics	IPGP	1/28/2008
Heidrick & Struggles International, Inc	HSII	10/18/2007	Juniper Networks, Inc.	JNPR	1/30/2008
Sucampo Pharmaceuticals, Inc	SCMP	10/22/2007	American Public Education, Inc.	APEI	2/4/2008
Tasty Baking Company	TSTY	10/23/2007	CV Therapeutics, Inc.	CVTX	2/8/2008
Sutor Technology Group Limited	SUOT	2/11/2008	FuelCell Energy Inc	FUEL	7/15/2008
Cisco Systems, Inc.	CSCO	2/12/2008	Dollar Tree Inc	DLTR	7/17/2008
ARIAD Pharmaceuticals, Inc.	ARIA	2/13/2008	Petroleum Development Corp	PETD	7/18/2008
Scholastic Corporation	SCHL	2/14/2008	Philadelphia Consolidated Holding Co	PHLY	7/22/2008
NYFIX, Inc.	NYFX	2/19/2008	Perrigo Company Inc	PRGO	7/25/2008
Sirona Dental Systems, Inc.	SIRO	2/26/2008	Questcor Pharmaceuticals Inc	QCOR	8/6/2008
United Online, Inc.	UNTD	2/27/2008	Masimo Corp	MASI	8/7/2008
Charter Communications, Inc.	CHTR	2/29/2008	CAS Medical Systems	CASM	8/8/2008
Spartan Stores, Inc.	SPTN	3/3/2008	Digital River Inc	DRIV	8/11/2008
Net 1 U.E.P.S. Technologies, Inc.	UEPS	3/4/2008	G&K service Inc	GKSR	8/12/2008
The Cheesecake Factory Incorporated	CAKE	3/5/2008	GTX Inc	GTXI	9/2/2008
Lincoln Electric Holdings, Inc.	LECO	3/7/2008	Semtec Corp	SMTC	9/5/2008
Peet's Coffee and Tea, Inc.	PEET	3/10/2008	Frontier Financial Corp	FTBK	9/8/2008
Rambus Inc.	RMBS	3/11/2008	Dynamics Materials Corp	BOOM	9/9/2008

Table 2: Sample

Firm	Ticker	Event Date	Firm	Ticker	Event Date
Elbit Systems Ltd.	ESLT	3/12/2008	Seagate Technolgy Inc	STX	9/16/2008
Shoe Carnival, Inc.	SCVL	3/14/2008	Websense Inc	WBSN	9/17/2008
Kelly Services, Inc.	KELYA(B)	3/17/2008	On Assignment Inc	ASGN	9/19/2008
Microchip Technology, Inc.	MCHP	3/19/2008	Jetblue Airways Inc	JBLU	9/23/2008
Shire plc	SHPG	3/25/2008	Novo A/S	NVO	9/24/2008
StealthGas, Inc.	GASS	3/26/2008	Hologic Inc	HOLX	10/1/2008
Priceline.com Incorporated	PCLN	4/4/2008	Verigy Inc	VRGY	10/6/2008
EXFO Electro-Optical Engineering	EXFO	4/10/2008	Akamai Technology Inc	AKAM	10/7/2008
First Niagara Financial Group, Inc.	FNFG	4/14/2008	Finisar Corp	FNSR	10/8/2008
A-Power Energy Generation Syst Ltd.	APWR	4/16/2008	Deckers Outdoor Corp	DECK	10/15/2008
Orion Energy Systems, Inc.	OESX	4/22/2008	Kaman Corp	KAMN	10/20/2008
Hudson City Bancorp, Inc.	HCBK	4/24/2008	Automatic Data Processing	ADP	10/21/2008
Churchill Downs Incorporated	CHDN	4/25/2008	Ultratech Inc	UTEK	10/22/2008
Ctrip.com International, Ltd.	CTRP	5/28/2008	Cent. European Media Enterprises Inc	CETV	10/23/2008
Molex Inc	MOLXA	6/3/2008	Whitney Holding Corp	WTNY	10/27/2008
AgFeed Industries Inc	FEED	6/4/2008	Allscripts Inc	MDRX	10/28/2008
Herculus Tech. Growth Capital Inc	HTGC	6/9/2008	Resources Connection Inc	RECN	10/30/2008
WorldFund and NII Holdings	NIHD	6/10/2008	Scholastic Corp	SCGL	10/31/2008
MicroStrategy Inc	MSTR	6/11/2008	LHC Group Inc	LHCG	11/5/2008
Hain Celestial Inc	HAIN	6/18/2008	RAM Energy Resources Inc	RAME	11/6/2008
Orion Marine Group Inc	OMGI	6/25/2008	Cirrus Logic Inc	CRUS	11/7/2008
Cognizant Solutions Inc	CTSH	6/26/2008	Wonder Auto Technology, In	WATG	11/7/2008
OraSure Technology Inc	OSUR	6/27/2008	Paulson Investment Company	PLCC	11/12/2008
Staples Inc	SPLS	7/8/2008	Genoptix Inc	GXDX	11/14/2008
SmartPros Inc	SPRO	7/9/2008	Martek Biosciences Inc	MATK	11/18/2008
Louisiana Bancorp	LABC	12/12/2008	Rambus Inc	RMBS	11/19/2008
Insight Enterprises	NSIT	12/15/2008	Cresud	CRESY	11/24/2008
Green Plains Renewable Energy	GPRE	12/19/2008	Concur Inc	CNQR	12/3/2008
SeraCare LifeSciences Inc	SRLS	12/22/2008	Dynamics Research Corp	CRCO	12/4/2008

A NEW SELECTION STRATEGY FOR PORTFOLIO DIVERSIFICATION IN THE EUROPEAN UNION

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ABSTRACT

Benefits of portfolio diversification transpire from the motivation of risk minimization and maximization of the expected return. Potential for global portfolio diversification has been recognized by the investors in recent years. A portfolio with the highest level of expected return for a given level of risk is said to be mean-variance efficient. Therefore, the risk-reward ratio of a globally diversified portfolio is expected to be optimum.

This paper proposes a method of portfolio selection on the basis of partial correlation criterion by seeking market relationship that is independent of world market. Portfolios are constructed using both partial correlation approach and Markowitz (or correlation) approach in the EU for two different home markets France and Germany. The performance of these portfolios has been measured for three different strategies to determine the proportion of asset allocation in the portfolio. The findings of this study suggest that the optimum strategy that minimizes the coefficient of variation to determine the proportion of asset allocation has a better potential for diversification. Furthermore the results reveal that, the partial correlation approach produces superior portfolios as opposed to Markowitz approach based on Sharpe's performance measure.

INTRODUCTION

The benefits of global portfolio diversification have been largely accepted and recognized by the investors in recent years. An extensive literature discussion in this research area appears in Solnik (1988). Benefits of portfolio diversification emerge from the motivation of minimizing risk and maximizing the return. One measure of portfolio risk is the portfolio variance. Portfolio variance depends on the variance of each asset and also the correlations among themselves. Thus, correlation plays a vital role in the creation of diversified portfolio. Researchers (Grubel, 1968; Bailey & Stulz, 1990; Divecha et al, 1992; Michaud et al. 1996) have shown that benefits of portfolio diversification are stemming from the relatively low correlations between equity markets in the global arena. Yet, the spurious nature of correlation between country indexes due to global market dominance may impact the likely benefits of global investment. A natural prevention of global market dominance in diversified portfolio creation is to use partial correlation with respect to the world market.

This paper explores the opportunities for investment diversification in the EU stock markets by employing partial correlation in portfolio creation. Research studies conducted recently showed that the central European stock markets are not yet integrated with the stock markets of the EMU members such as Germany. Gilmore and McManus (2002) conducted co-integration tests on stock markets of Germany, Poland, the Czech Republic and Hungary. They found no long-term relationship between the German market

and the three central European markets. Naidu and Choudhury (2004) conducted co-integration tests on stock markets of France and the ten new members of the Union and found that the stock markets are not yet integrated. The lack of integration among the 25 EU stock markets offers an opportunity for investors in and outside of EU to diversify and reduce risk. Gilmore and McManus (2003) examined this very specific issue. They found that the U.S. investors and German investors can reduce risk by diversifying their equity portfolios into the central European equity markets such as Poland, Czechoslovakia, and Hungary. Naidu and Choudhury (2006) proposed that country's beta estimate offers a better insight to judge the extent of risk reduction achievable through international diversification.

Here, we propose partial correlation criterion to select assets in the portfolio and optimization of coefficient of variation to determine the proportion of asset allocation in EU countries for French and German investors. We evaluate their performance using Sharpe's Index and compare them with portfolios created by simple correlation criterion. In general, results based on performance measure indicate that partial correlation approach (i.e., partialing out the influence of world market) is superior to Markowitz approach (correlation based). Moreover, proportion of asset allocation based on optimizing the coefficient of variation produced portfolios that have positive risk-adjusted return.

RESEARCH METHODOLOGY

The idea of risk reduction using the correlation structure of returns determines the extent of benefits derived through diversification. This idea of smaller the degree of correlation the greater the benefit of diversification was popularized by Harry Markowitz (1959). However, in the context of global market the degree of correlation between two markets is also influenced by aggregated world market. Therefore, the apparent magnitude of a correlation between two specific markets may be due to the influence of world market on those markets. As for example, the level of correlations between France & Hungary and Germany & Hungary has decreased dramatically from 0.296271 and 0.315271 to 0.097316 and 0.093948 (see Table 1) respectively when calculated as a partial correlation with respect to the world market. Thus, partialing out the influence of world market to create portfolios for diversification may lead to a better performance.

Theoretical Background

As the global market in the international arena becomes more integrated, the developed markets have displayed greater synchronization compared to emerging markets. Therefore, recent liberalization of emerging markets and their increasing involvement into the world market creates an opportunity for portfolio diversification. Collectively all national equity markets together creates global capital market. Therefore, if we aggregate all the national equity markets we will have a great world equity market. Each national equity market has its own degree of volatility. However, the volatility relative to each other will be different. In the same way an equity market's volatility relative to an index of world equity market will be different. Just as one can estimate the risk of an asset relative to a market index, one can also estimate the risk of a national equity market relative to world equity market index. Thus, a country's correlation is the measure of its market's sensitivity to world market variability. Bekaert and Harvey (1997) concluded that market volatility is a function of the openness of its economy. Therefore, a country's correlation is indicative of integrator. The smaller the correlation, the more segmented is the country's market and hence better will be the gains from

diversification. Consequently, international diversification pushes out the efficient frontier further by allowing investors simultaneously to reduce their risk and increase their expected return. Similarly, we can also study the sensitivity of a given equity market to the movements of another equity market of our interest. For example, if we want to know how sensitive the Hungarian equity market is relative to the movements in German equity market, we can examine this relationship by estimating country correlation for Hungary with respect to the German equity market. Markowitz (1959) theorized that the smaller the degree of correlation the greater is the benefits of diversification. However, this theory looks too simple when it comes to global diversification. In a global market, it is possible for a pair of countries to have a high degree of correlation between themselves and yet have low degree of partial correlation after purging the world market influence.

Exhibit 1 [Correlation based portfolios]

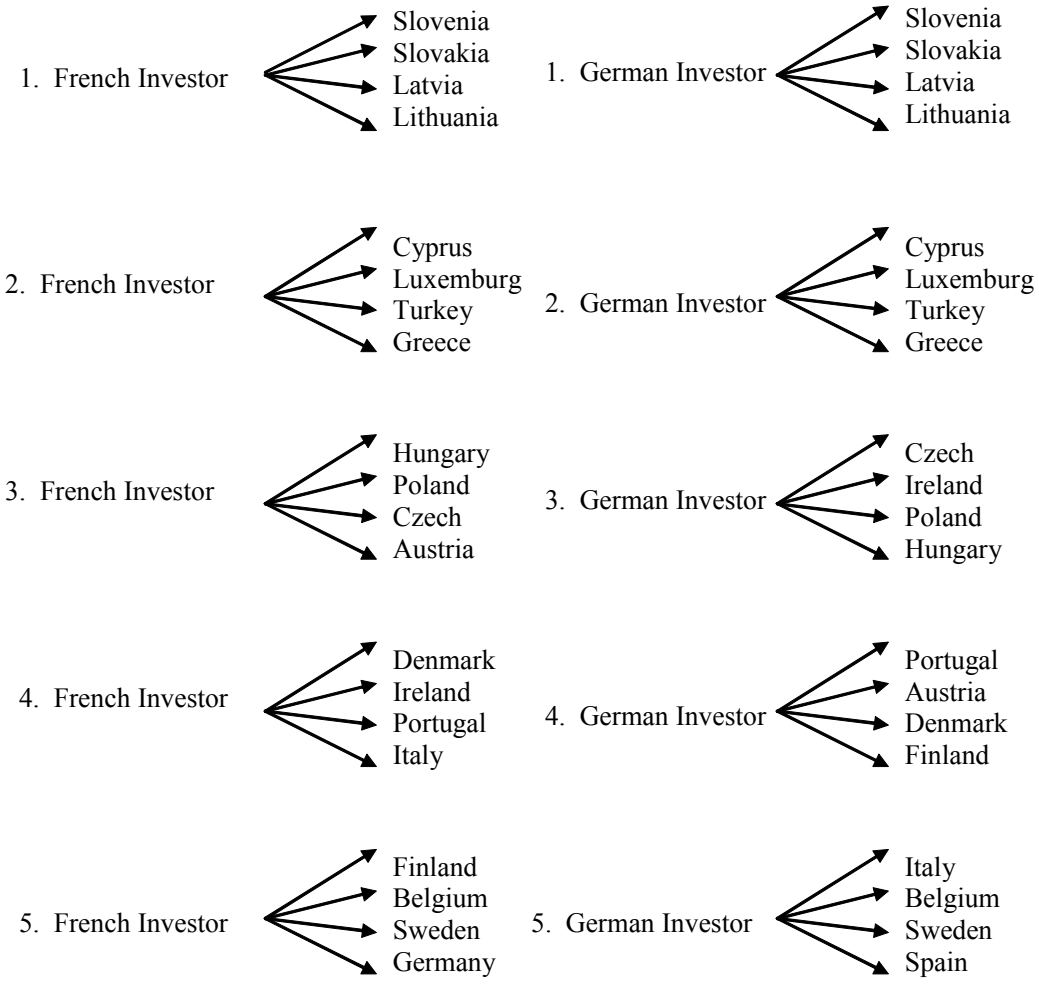
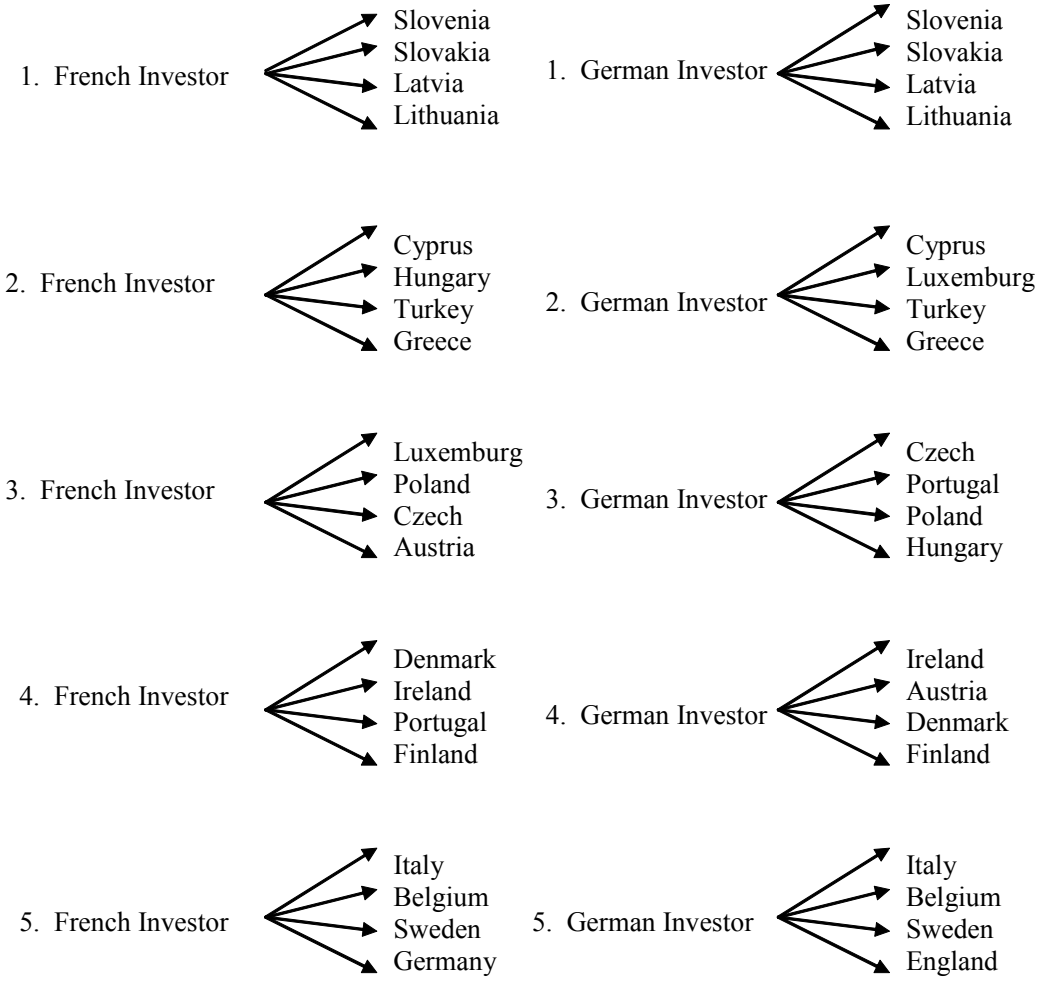


Exhibit 2 [Partial-Correlation based portfolios]



Partial correlation between country i and country j with respect to the World Market can be expressed as (Neter, Wasserman, and Kutner, 1990):

$$r_{ij.w} = \sqrt{\frac{\left(r_{ij} - r_{wj}\, r_{iw}\right)^2}{\left(1 - r_{wj}^2\right)\left(1 - r_{iw}^2\right)}}$$

where $r_{i,j}$ Correlation coefficient between ith market returns and jth market returns.

For example,

$$\rho_{Hungary,France} = 0.30 \qquad Partial\ Correlation_{Hungary,France} = 0.09$$

$$\rho_{Hungary,Germany} = 0.32 \qquad Partial\ Correlation_{Hungary,Germany} = 0.09$$

In this example, the difference in correlations and partial correlations may produce different portfolios. Therefore, even though Hungary and France or Hungary and Germany had higher degree of correlation (0.30 & 0.32), their partial correlations imply that they offer better gains from diversification compared to other markets that do not have such an overpowering world market influence. In fact, Hungary moved up to the second portfolio level from the third portfolio level when portfolios are created by partial correlations instead of correlations (see Exhibit 1 and Exhibit 2). This example demonstrates that better gains from diversification may be achieved by using partial correlations rather than the simple correlations. In addition, the relational stability between two countries for the diversification purposes may be more desirable when their correlations and partial correlations remain same (or similar) in the long run. On the basis of this theory we develop two sets of portfolios using: a) correlations and b) partial correlations as a criterion.

Diversification Strategy

Portfolios are constructed for the purpose of diversification in the EU stock markets for French and German investors respectively. We identify the opportunity for portfolio diversification using both correlation and partial correlation criterion for selecting the country into a portfolio. For example, a French investor may look at the remaining 24 countries and select the country with the smallest correlation or partial correlation to invest. The country with the next highest correlation or partial correlation could be the second investment to add to the portfolio. Following this procedure the investor will allocate funds to the markets in an ascending order of the country's correlation or partial correlation value --- the smallest correlation or partial correlation country will be chosen first and the highest correlation or partial correlation country will be chosen last. In this process of portfolio selection three strategies are adopted. First, majority fund allocation (80%) was applied to the home country and rest of the 20% was equally divided among the four other countries (5% each). This is called Home country strategy (HOME). So a French investor will have 80% of the funds invested in French stock market and 20% outside of France. Second, funds are equally (20% each) allocated to all five countries in the portfolio. This is called Naïve strategy (NAÏVE). Third, proportion of funds that are allocated to five different countries is determined by optimizing the coefficient of variation (calculation is done via a nonlinear optimization program in SAS) and the strategy is called Optimum strategy (OPTM). Following these procedures, the French investor will have five portfolios (five-assets each). Similarly, five portfolios are constructed for the German investor. In total, we have 10 portfolios constructed and calculated for each strategy to measure the performance. The risk-return characteristics of these portfolios are estimated for the eight year period, 1995-2002. We hope to demonstrate that partial correlation based approach to portfolio diversification offers a new way to build globally diversified portfolios. We have evaluated each portfolio performance using Sharpe's Index.

The Optimum strategy (OPTM) involves identifying the optimum proportion of funds allocated among five different countries in each portfolio. To attain that, coefficient of variation (CV) is optimized (minimized in this case) with respect to proportions (weights or percentages) of fund allocations. Therefore,

the objective function *f (W)* is optimized (by calling SAS nonlinear optimization sub-routine NLPTR into the SAS program) as below.

Minimize:

$$f(W) = \frac{W' \Sigma W}{W' \mu} x100$$

s.t: $0 \leq W_i \leq 1$ *for i =1, ..., 5* and

$$\sum_{i=1}^{5} W_i = 1$$

where *W* and μ are defined below.

Measures of Performance

To evaluate the performance of a portfolio, both return and risk should be incorporated into the performance measure. A portfolio is said to be mean-variance efficient if it possess the highest level of expected return at a given level of risk. Equivalently, it is efficient if it has the lowest level of risk for a given level of expected return. Thus, the desire for global (external) diversification is to optimize the risk-reward ratio, which also reinforces the importance of country selection strategy for an optimum portfolio. Portfolios that are diversified globally have more potential to lower the risk for the same level of expected return, or to increase the return for the same risk level. Consequently, the risk-reward ratio of a globally diversified portfolio is potentially far better-off.

Coefficient of variation (CV) measures the relative variability and can be used to measure the standardized risk with respect to the mean. Therefore, coefficient of variation can be considered a risk-reward ratio. Coefficient of variation of a portfolio return is expressed as,

$$CV_p = \frac{\sigma_p}{\mu_p} x100$$

The smaller the CV the better is the performance of the portfolio. Thus, a portfolio is considered to be more diversified if the CV is smaller in magnitude.

William Sharpe (1966) developed a composite (risk-adjusted) measure of portfolio performance called the reward-to-variability ratio. This measure also known as Sharpe's Performance Index (PI), which can be expressed as,

$$PI_p = \frac{\mu_p - r}{\sigma_p}$$

Where, σ_p = standard deviation of pth portfolio return, μ_p average return of pth portfolio, r = risk-free rate for this period. Therefore, the higher the values of the index better the performance of that portfolio on risk-adjusted basis.

Performance of a portfolio diversification will be evaluated by using the expected return and standard deviation of return for a portfolio consisting of a proportion of assets invested in the home country and the remaining portion of assets invested in four other countries (or markets). We will attempt to develop and evaluate three different strategies to determine the proportion (weights) of asset allocation in constructing a portfolio.

The expected return and variance of a portfolio is expressed as,

$$\mu_p = W' \mu \qquad and \qquad V_p = W' \Sigma W$$

where, W is the vector of portfolio weights (or proportion) for different markets, μ is the mean vector of returns of markets in the portfolio, and Σ is the variance-covariance matrix. For example, the mean and variance of a portfolio with only two markets (assets) can be written as,

$$\mu_p = w_1\mu_1 + w_2\mu_2 \qquad V_p = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2\, w_1 w_2 \sigma_{12}\sigma_1\sigma_2$$

Where, μ_1 average return of market-1, μ_2 average return of market-2, σ_1 standard deviation of return of market-1, σ_2 standard deviation of return of market-2, $\sigma_1\sigma_2$ covariance of returns between market-1 and market-2.

EMPIRICAL RESULTS

The data for this study covers the period, 1995-2002. The daily data for all the stock market indices of the EU region were obtained from Global Financial Data, Inc. and SourceOECD. The daily returns were computed and annualized. Since, the correlation structure of returns has been one of the bases for judging the diversification (risk reduction) potential. We have estimated the correlation structure of annualized daily stock returns among the EU equity markets and presented in Table 1, along with mean and standard deviation. As pointed out earlier in the paper, for certain markets the correlation structure does not give us adequate picture of diversification potential when global diversification is sought. However, partial correlation criteria may have a greater potential for global diversification. Therefore, we estimated partial correlation for all the EU stock markets with respect to the world market. This helps to observe the relationship between two markets independent (without the influence) of world market. We have used Morgan Stanley Capital International Index to represent World Equity Market. These partial correlations are also reported in Table 1.

As discussed in the methodology section above, a set of 10 portfolios were created using Markowitz approach (correlation). We have also created another set of 10 portfolios using partial correlation as the basis for market (country) selection. The set of portfolios appear in Exhibit 1 and Exhibit 2. As can be seen from these exhibits, the least correlated country (asset) portfolio and the lowest partial correlation portfolio are exactly identical in composition of countries. Furthermore, the first portfolio constructed at the lowest risk level is the same regardless of the investors' home market. The portfolio composition changes, however, as the correlation and the partial correlation levels ascend. For example, the portfolio-2 for French investor has a slightly different composition using partial correlation than correlation criterion. A similar change in composition occurs to German investors in portfolio-3. Therefore, it appears that at or above second level of

screening, using correlation as selection basis produces portfolio that is different in composition than that produced by the partial correlation as the selection criterion.

TABLE 1: Correlations, Partial Correlations, Means, and Standard Deviations of Annualized Daily Stock Market Returns (1995-2002)

Country	France (Correlations)	Germany (Correlations)	World (Correlations)	France (Partial * Correlations)	Germany (Partial * Correlations)	Mean	Std Dev
Cyprus	0.059046	0.046494	0.038089	0.057608	0.04837	2.548886	31.61424
Czech	0.351897	0.324579	0.306574	0.247331	0.171775	0.840479	15.25584
Hungary	0.296271	0.315279	0.337839	0.093318	0.094988	1.428562	17.77597
Latvia	0.008884	-0.01817	0.023028	0.002168	-0.04513	3.682336	32.09027
Lithuania	0.020614	-0.0047	0.018747	0.030142	-0.03859	2.885802	54.48763
Poland	0.36543	0.378087	0.319775	0.193474	0.181609	2.975744	26.76885
Slovak	0.029986	0.022593	0.032422	-0.01259	-0.0077	0.951593	18.09857
Slovenia	0.020692	0.01494	-0.0049	0.038167	0.021164	1.634605	19.97969
Turkey	0.16319	0.158906	0.138863	0.07028	0.077605	9.048344	46.25241
Austria	0.426421	0.468396	0.346697	0.268252	0.225224	0.468229	9.771192
Belgium	0.683377	0.647613	0.584029	0.537781	0.407067	1.024673	14.19741
Finland	0.62046	0.599263	0.533238	0.364432	0.330889	3.905338	29.09374
France	1	0.76984	0.660969	1	0.596944	1.64994	18.26091
Germany	0.76984	1	0.689527	0.596944	1	1.794359	19.6342
Greece	0.234955	0.232911	0.235565	0.097316	0.093948	2.399457	22.49086
Ireland	0.447095	0.43481	0.362534	0.275083	0.234488	0.92267	12.63724
Italy	0.601259	0.603676	0.487409	0.422716	0.352264	1.408155	15.88367
Luxemburg	0.281296	0.261491	0.233913	0.165545	0.09329	0.854859	12.86015
Portugal	0.495286	0.462819	0.406607	0.320371	0.191465	0.706565	11.05724
Spain	0.789752	0.695305	0.60665	0.684668	0.489938	1.788768	18.33543
Netherlands	0.835584	0.779351	0.651458	0.763377	0.590349	1.674792	18.23667
Denmark	0.568403	0.561496	0.468453	0.414377	0.32492	0.853833	11.13353
Sweden	0.735656	0.680177	0.60467	0.566881	0.448312	1.672451	18.13933
England	0.789947	0.701462	0.655697	0.679595	0.476048	0.96971	14.10533
World	0.660969	0.689527	1	0.057608	0.04837	0.632045	10.78917

* Partial correlations are calculated with respect to World Index.

TABLE 2: Portfolio performance on three different strategies.
(*Correlation is used for* portfolio selection)

Portfolios of investment	Strategy	MEAN	STD	CV %	Sharpe Index	Percent (%) allocation in portfolio				
						Home	Four other countries*			
French-1	OPTM	2.00	11.34	567.80	-0.18	30.05	22.08	2.85	26.13	18.90
	HOME	1.78	15.22	856.33	-0.15	80.00	5.00	5.00	5.00	5.00
	NAIVE	2.16	15.45	715.21	-0.12	20.00	20.00	20.00	20.00	20.00
French-2	OPTM	4.07	18.10	444.38	0.00	16.06	16.24	30.30	21.51	15.88
	HOME	2.06	15.90	770.87	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	3.30	15.07	456.56	-0.05	20.00	20.00	20.00	20.00	20.00
French-3	OPTM	2.18	17.55	804.72	-0.11	42.71	14.75	0.00	42.53	0.00
	HOME	1.61	16.04	999.11	-0.15	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.47	12.78	867.59	-0.20	20.00	20.00	20.00	20.00	20.00
French-4	OPTM	1.21	11.58	959.06	-0.25	25.26	23.67	9.34	14.72	27.00
	HOME	1.51	16.06	1060.21	-0.16	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.11	10.70	965.80	-0.28	20.00	20.00	20.00	20.00	20.00
French-5	OPTM	3.28	24.33	741.15	-0.03	0.00	76.12	15.34	0.00	8.54
	HOME	1.74	17.58	1010.69	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	2.01	16.93	842.32	-0.12	20.00	20.00	20.00	20.00	20.00
German-1	OPTM	2.05	11.44	558.55	-0.18	29.63	22.35	3.05	26.05	18.92
	HOME	1.89	16.16	853.66	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	2.19	15.39	702.93	-0.12	20.00	20.00	20.00	20.00	20.00
German-2	OPTM	4.09	18.14	443.33	0.00	16.30	16.34	30.24	21.25	15.87
	HOME	2.18	16.94	777.67	-0.11	80.00	5.00	5.00	5.00	5.00
	NAIVE	3.33	15.16	455.31	-0.05	20.00	20.00	20.00	20.00	20.00
German-3	OPTM	1.96	15.47	791.07	-0.14	27.99	9.08	0.00	36.19	26.74
	HOME	1.74	17.22	987.41	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.59	13.26	832.42	-0.19	20.00	20.00	20.00	20.00	20.00
German-4	OPTM	3.12	23.16	741.72	-0.04	10.66	7.03	0.00	10.90	71.41
	HOME	1.73	17.50	1010.34	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.55	12.63	817.05	-0.20	20.00	20.00	20.00	20.00	20.00
German-5	OPTM	1.65	15.14	918.82	-0.16	13.72	30.35	0.00	22.96	32.97
	HOME	1.73	18.02	1041.56	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.54	14.44	938.87	-0.17	20.00	20.00	20.00	20.00	20.00

* See assigned countries of a portfolio in Exhibit 1.
Note: Five portfolios have been created using correlations in ascending order for each home country (France & Germany).
OPTM—Percentage allocation obtained by using optimization of CV.
HOME--Percentage allocation is dominated by 80% in the home country.
NAÏVE—Percentage allocation is equally weighted (20%) for all five countries in the portfolio.

TABLE 3: Portfolio performance on three different strategies.
(*Partial correlation is used for* portfolio selection)

Portfolios of investment	Strategy	MEAN	STD	CV %	Sharpe Index	Percent (%) allocation in portfolio				
						Home	Four other countries*			
French-1	OPTM	2.00	11.34	567.80	-0.18	30.05	22.08	2.85	26.13	18.90
	HOME	1.78	15.22	856.33	-0.15	80.00	5.00	5.00	5.00	5.00
	NAIVE	2.16	15.45	715.21	-0.12	20.00	20.00	20.00	20.00	20.00
French-2	OPTM	4.57	20.42	446.99	0.02	21.45	18.70	34.63	0.08	25.14
	HOME	2.09	16.02	766.28	-0.12	80.00	5.00	5.00	5.00	5.00
	NAIVE	3.42	15.95	467.09	-0.04	20.00	20.00	20.00	20.00	20.00
French-3	OPTM	1.91	15.07	787.80	-0.14	32.46	29.14	37.75	0.65	0.00
	HOME	1.58	15.90	1008.56	-0.16	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.36	11.38	838.11	-0.24	20.00	20.00	20.00	20.00	20.00
French-4	OPTM	2.81	20.74	738.04	-0.06	0.12	22.64	6.14	63.87	7.24
	HOME	1.64	16.52	1007.82	-0.15	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.61	12.86	799.71	-0.19	20.00	20.00	20.00	20.00	20.00
French-5	OPTM	1.60	15.16	948.53	-0.16	11.54	36.70	0.00	30.63	21.12
	HOME	1.61	17.11	1059.39	-0.14	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.51	14.63	969.22	-0.17	20.00	20.00	20.00	20.00	20.00
German-1	OPTM	2.05	11.44	558.55	-0.18	29.63	22.35	3.05	26.05	18.92
	HOME	1.89	16.16	853.66	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	2.19	15.39	702.93	-0.12	20.00	20.00	20.00	20.00	20.00
German-2	OPTM	4.09	18.14	443.33	0.00	16.30	16.34	30.24	15.87	21.25
	HOME	2.18	16.94	777.67	-0.11	80.00	5.00	5.00	5.00	5.00
	NAIVE	3.33	15.16	455.31	-0.05	20.00	20.00	20.00	20.00	20.00
German-3	OPTM	2.23	18.01	806.21	-0.10	40.30	14.02	0.00	43.53	2.15
	HOME	1.73	17.20	992.59	-0.14	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.55	13.23	853.93	-0.19	20.00	20.00	20.00	20.00	20.00
German-4	OPTM	2.92	21.52	737.27	-0.05	8.06	0.00	22.47	4.80	64.68
	HOME	1.74	17.52	1005.42	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.59	12.81	805.98	-0.19	20.00	20.00	20.00	20.00	20.00
German-5	OPTM	1.59	15.10	951.23	-0.16	25.24	37.90	2.37	34.50	0.00
	HOME	1.69	17.87	1057.88	-0.13	80.00	5.00	5.00	5.00	5.00
	NAIVE	1.37	13.74	999.88	-0.20	20.00	20.00	20.00	20.00	20.00

* See assigned countries of a portfolio in Exhibit 2.
Note: Five portfolios have been created using partial correlations in ascending order for each home country (France & Germany).
OPTM—Percentage allocation obtained by using optimization of CV.
HOME--Percentage allocation is dominated by 80% in the home country.
NAÏVE—Percentage allocation is equally weighted (20%) for all five countries in the portfolio.

Table 2 presents the mean, standard deviation, coefficient of variation, and Sharpe's Index for all 10 portfolios constructed using the correlation-based (Markowitz) screening criterion. Each portfolio is evaluated for three strategies of proportion of asset allocation. Sharpe's Index values are mostly negative implying that eight out of ten portfolios constructed using Markowitz approach underperformed the risk-free assets (short-term government debt) in their respective home markets. The degree of underperformance varied greatly among the 10 portfolios. Yet, optimum diversified portfolio produced expected return (4.07 and 4.09 for French and German respectively), two and a half times more than the expected return received in the home country alone, at the same risk level.

Table 3 displays the mean, standard deviation, coefficient of variation, and Sharpe's Index for 10 portfolios constructed using the partial correlation as the basis for screening. Each portfolio is evaluated for all three strategies of proportion of asset allocation. While a majority of portfolios constructed using partial correlation approach produced negative values of Sharpe's Index, the second set of portfolios for French showed uniquely positive values of Sharpe's Index and lower values for coefficient of variation. Thus, partial correlation based method of constructing portfolios produced superior performance of risk-adjusted returns compared to Markowitz method. Using optimum strategy for determining proportion of asset allocation, the stock markets of Cyprus, Turkey, Hungary, and Greece offered an opportunity for investors in France to diversify and construct portfolios with superior risk-adjusted performance in the EU. The evidence supports the argument that portfolio risk can be substantially reduced or expected return can be enhanced by employing optimum strategy (OPTM) for portfolio diversification in the European Union.

CONCLUSION

The simplest way to measure the benefit of a portfolio diversification in the European Union is to estimate how much portfolio diversification can reduce the variance and or increase the expected return of a diversified portfolio compared to the home country's variance and expected return. International portfolio diversification is advocated to earn higher returns with lower risk in a world of less integrated capital markets. Markowitz approach to domestic diversification was simply extended to global diversification by Levy and Sarnat (1970) and Solnik (1974). Little attention has been directed toward the investigation of reducing global market influence for potential diversification gain in international arena. This paper proposes a method of portfolio selection on the basis of partial correlation criterion by seeking market relationship that is independent of world market. Portfolios are constructed using both partial correlation approach and Markowitz (correlation) approach for two different home markets France and Germany. Then, the performances of these portfolios have been measured for three different strategies in determining the proportion of asset allocation in the portfolio. An interesting finding is that, the two different approaches produce portfolios with different composition of markets, but the composition of markets stay same for the first portfolio in both home markets. Further analysis reveals that partial correlation approach produces superior portfolios as opposed to Markowitz approach. Moreover, the optimum strategy that minimizes the coefficient of variation to determine the proportion of asset allocation has a better potential for diversification compared to two other strategies considered in this paper.

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PERCEPTIONS OF AUDITOR INDEPENDENCE: EVIDENCE FROM CPAS', LOAN OFFICERS, AND THE GENERAL PUBLIC

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ABSTRACT

The Sarbanes-Oxley Act of 2002 (SOX) included many components designed to increase auditor independence. Despite these intentions, research finds that many of the included provisions may not have influenced independence as intended. As recent studies focused primarily on independence in fact, not independence in appearance, we surmise that SOX influences the perception of independence. We also suspect that perceptions of users will vary with respect to various aspects of audit quality.

To test our beliefs, we surveyed CPAs, loan officers, and the general public inquiring whether specific components of SOX would increase auditor independence. Members of all three groups indicated that they thought each provision tested would increase independence, but they differed both in the extent they thought the provisions increase independence and in the relative rankings of the different provisions. We also found evidence that the expectation gap is still in existence, with both sophisticated users and the general public having lower perceptions of audit quality as compared to CPA's.

The results of this paper suggest that SOX may increase confidence in the audit process by increasing perceptions of independence. Evidence supporting the continuance of an expectations gap between CPAs and users of financial statements is also present.

INTRODUCTION

The turn of the century signaled not only the start of a new millennium, but also a time of significant change for the accounting profession. For the first time since the formation of the Securities Exchange Commission in 1933, the government exercised its right to legislate audits of public companies. The accounting profession had been self regulated and relied upon the Audit Standards Board, a body of the American Institute of Certified Public Accountants, to enact rules governing audits of both private and public companies. As with other catastrophic events affecting the public, it was necessary for someone to step forward and restore the public trust (Gostick & Telford 2003). Thus we now have the Sarbanes-Oxley Act of 2002 (SOX).

As SOX is a relatively recent phenomenon, many of the details of how to interpret and implement the standards have yet to be put to the test of time. Many of the provisions of SOX focus on auditors maintaining independence with respect to the companies they audit. Several recent archival studies have shown these provisions have no effect on auditors with respect to independence in fact (DeFond & Francis

2005). While auditor independence is essential to an effective audit and the reliability of financial information (Wallman 1996), independence in appearance is just as important. This paper focuses on how the provisions of SOX have impacted independence of appearance based on the perceptions of several key groups: accountants, sophisticated financial statement users (loan officers), and the general public.

To test the perceptions of these groups, a series of questions related to both active provisions of SOX and proposed provisions were presented to the groups. These questions focused on Title I, II, and III of SOX involving the creation of the PCAOB, auditor independence, and corporate governance, respectively. Analysis of these surveys then focuses on which provisions effect users' perceptions and how these perceptions vary among the various groups.

A second aspect of the study also examines how these recent events have influenced the expectation gap and the usefulness of auditing financial statements. Past studies (Hodge 2003; McEnroe & Martens 2001) have shown that the expectation gap still exists, and the perceived reliability of financial statements has gone down over time. Therefore, we examine whether these concerns still exist after the government intervention in regulating the profession by testing perceptions of various dimensions of audit quality (auditor independence, performance, responsibility, and competence as well as financial statement reliability).

This study shows that while the provisions may not have affected auditors' independence in fact, they do effectively influence users' perceptions of independence. All three groups report that they believe the provisions of SOX enhance independence. As such, the provisions of SOX continue to increase users' trust in the accounting profession and the financial statements for which they provide assurance services. We also find that the CPA's have less confidence in the SOX's provisions than the other studied groups, and that they also have more confidence in the quality of financial statement audits they audit as well as their independence with respect to clients.

The remainder of the paper is organized as follows. The next section reviews the existing literature and develops the hypotheses. The third section discusses the method by which the data is collected. The fourth section examines the results of the study. The final section presents a conclusion for the paper, including limitations of the study, and future research.

LITERATURE REVIEW AND HYPOTHESES

Actual independence and perceived independence are separate constructs. In Accounting Series Release No. 269, the SEC recognized the distinction but also recognized both as being equal in importance (Olazabul & Almer 2001). Several commentators note the existence of both (Sutton 1997; Kinney 1999). Actual independence in fact is a frame of mind that is impossible to measure, so regulations regarding auditor independence tend to focus on the perception of independence (Schuetze 1994). Despite this focus on perception, investors who place value on auditor independence believe that independence in fact is present. Accordingly, they believe independence has a desirable effect upon the quality of audits. Research that tests whether the items believed to impair audit independence and thus audit quality have not always found the commonly expected results.

Since the state of mind of public accountants cannot be known, research on independence in fact compares incentives to not be independent to evidence of audit quality. Research has found an association between non-audit fees and earnings surprises, discretionary accruals, and lower share prices (Frankel, Johnson & Nelson 2002), between the ratio of non-audit fees to audit fees and total accruals (Larcker &

Richardson 2004), and between unspecified non-audit fees and financial statement restatements (Kinney, Palmrose & Scholz 2004). Contrary to these findings, other study's using different research designs or datasets have found non-audit fees or total fees are not associated with earnings surprises, discretionary accruals, importance of client to firm, going concern opinions, financial statement restatements, or auditor assessment of client systems (Reynolds, Deis & Francis 2004; Chung & Kallapur 2003; Geiger & Rama 2003; Defond, Raghumandan & Subramanyam 2002; Ashbaugh, LaFond & Mayhew 2003; Larcker & Richardson 2004; Kinney, Palmrose & Scholz 2004; Raghunandan, Read & Whisenant 2003; Davidson & Emby 1996). The findings between these studies, and sometimes even within the study, are inconsistent as to whether the proxies for auditor independence actually influence audit quality (DeFond & Francis 2005). As such, it cannot be determined without doubt whether the factors associated with non-independence, such as non-audit fees, are actually consistently related to a state of mind that indicates a lack of independence in fact. If independence is a core value or a strategic necessity to public accounting (Kinney 1999), it is in the profession's best interest to remain independent in spite of short-term incentives to act otherwise.

If it is difficult to regulate a state of mind, perception may be influenced through regulation. The perception of independence, as regulated by SOX, could then act to restore confidence in the financial markets after the scandals of 2001. The question for research is then whether changing the relationship between auditor and client influences perceptions of independence, and whether that perception influences investor decisions. However, since initial attempts to answer this question (Schulte 1965; Lavin 1976) research regarding perceptions of independence remains somewhat divided. Some research does not find a change in perception by sophisticated financial statement users in auditor independence based on different levels of management advisory services provided by a public accountant (Pany & Reckers 1988; Pany & Reckers 1987; Knapp 1985; McKinley, Pany & Reckers 1985; Reckers & Stagliano 1981) or that various non-audit functions cause a perception of low independence in less sophisticated users (Jenkins & Krawczyk 2001; Reckers & Stagliano 1981). Other research has found a link between perceptions of independence and non-audit services (Brandon, Crabtree & Maher 2004; Mauldin 2003; Swanger & Chewnin, 2001; Lowe, Geiger & Pany 1999; Lowe & Pany 1995; Gul 1991; Pany & Reckers 1984; Pany & Reckers 1983; Shockley 1981). Most recently, using earnings response coefficients and shareholder ratification votes as proxies for perceptions of auditor independence, Mishrah, Raghunandan & Rama (2005) and Krishnan, Sami & Zhang (2005) both found a negative relationship between non-audit services and auditor independence.

Other avenues of research have examined the effects of employment, partner rotation, and audit client relationships on perceptions of auditor independence. Similar to the earlier research involving other factors influencing auditor independence, these studies (Goodwin & Seow 2002; Koh & Mahathevan 1993; Firth 1981; Imhoff 1978) find no consistent basis for which factors influence perceptions of independence. Additionally, Gaynor, McDaniel & Neal (2006) find that audit committees are less likely to approve nonaudit services due to disclosure requirements, even when the services would improve audit quality. Combined, these studies have examined a number of the provisions in Title I, II, and III of SOX. As results are varied and significant changes have been made in accounting regulations since the majority of these studies, our research aims to find if SOX improves perceptions of independence, for which we have developed two hypotheses.

We believe that the Sarbanes-Oxley Act was passed in part to improve confidence in the financial markets of the United States, a belief shared with others (e.g., Jain & Rezaee 2006; Guerra 2004). Because much of the crisis motivating the passage of SOX was related to audit failures, much of SOX relates to

improving audit performance, and especially to increasing auditor independence from the client. The specific provisions of SOX regarding independence were enacted because they were perceived to increase auditor independence.

Hypothesis 1: The provisions of the Sarbanes-Oxley Act are perceived to increase auditors' independence from their clients.

We also believe the various groups tested (CPA's, Loan Officers, and the General Public) will vary in their perceived value of the SOX provisions. Although CPA's may feel that certain practices may dilute independence, we believe that they often believe that they are capable of self-regulation of independence and that the accounting profession has intrinsic incentives in maintaining independence (Kinney 1999).

Hypothesis 2: The perceived benefit of the SOX provisions will vary among the CPA's, sophisticated users (e.g., loan officers), and the general public.

In addition to perceptions of the recent SOX provisions, we also test each group's perception of audit quality (auditor independence, performance, responsibility, competence, and financial statement reliability). Past studies (Hodge 2003; McEnroe & Martens 2001) have shown that the expectation gap still exists, and the perceived reliability of financial statements has gone down over time interpretations of unqualified audit reports (McEnroe & Martens 2001), definitions of auditor duties (Porter 1993), and expected levels of assurance (Epstein & Geiger 1994) differ between auditors and investors. We examine whether these concerns still exist after the government intervention in regulating the profession by testing perceptions of various dimensions of the expectations gap between auditors and other stakeholders.

Hypothesis 3: Perceptions of audit quality (auditor independence, performance, responsibility, competence, and financial statement reliability) will vary among CPA's, sophisticated users (e.g., loan officers), and the general public.

METHOD

To test the hypotheses, we designed a survey regarding the provisions of SOX. The survey includes three sections. The first section lists questions regarding perceptions of how provisions of SOX influence auditor independence. The second section lists questions regarding perceptions of audit quality (auditor independence, performance, responsibility, competence, and financial statement reliability). The third section requests demographic information for each of the three groups. The SOX questions are answered on a 0-6 scale, with 0 representing no effect on independence and 6 representing a positive effect on independence for the SOX questions. For the audit quality questions, 0 represents a more negative view of the audit process or less confidence that audits are completed in an independent and competent manner, whereas 6 represents greater confidence in the audit process[i].

Most of the questions are derived directly from Title I, II, and III of SOX. Specifically, Questions 1 and 11 fall within Title I, Questions 2, 3, 5 and 7 fall within Title II, and Questions 8 and 9 fall within Title

III. The fee disclosure provision (Question 4) was mandated by the SEC in 2000 and modified in 2003 (SEC 2000; SEC 2003). We also include two provisions that are under consideration. These provisions were that of audit firm rotation (Question 6) and prohibiting tax services (Question 10). As the PCAOB continues to consider adoption of these provisions (PCAOB 2004), it is important to determine the potential effects of these provisions prior to implementation.

We also included some questions not directly tied to SOX that assess possible differences in opinion regarding the scope and quality of audits. The public interest in the role of public audits in preventing frauds increased as a result of the series of financial statement frauds in 2001. The AICPA released Statement on Auditing Standards No. 99, *Consideration of Fraud in a Financial Statement Audit* in 2002 (ASB 2002) to provide guidance for auditors to regard fraud in an audit. We ask our survey participants for their opinion regarding the responsibility for finding fraud in an audit. We also ask about the effect that receiving payment from the auditee for both audit and non-audit services may have upon the quality of an audit. Auditors may be biased to avoid conflict with clients to retain fees (Gavious 2007). Finally we ask for perceptions about the quality of audit output, financial statements, as well as the audit process itself and the training of the accountants that perform the audits.

Similar to the prior behavior studies, we selected subjects from three groups; CPA's, loan officers (sophisticated financial statement users), and the general public. Participants for CPA's and loan officers were randomly selected from commercially available mailing lists, with 250 surveys being sent to each group during the Spring of 2005. After adjusting for bad addresses, approximately 11 percent of the CPA's and 13 percent of the loan officers responded by completing the survey[ii]. For the public participants, email messages were sent to a list of consumers maintained by a data collection agency to solicit responses from the general public. Respondents were directed to a web page to complete the survey. As the actual number of email addresses in the list was maintained by the data collection agency, an exact response rate could not be determined. Demographic information for all participants is provided in Table 1. Of particular interest in the general public group is that they had a higher proportion with a college education than expected and the majority had personal investing experience. Thus their views represent both that of the general public, and that of non-professional investors[iii]. There are no significant differences between the groups except for gender. None of the results found in the survey differ by gender.

Table 1: Demographic information

	CPA	Loan Officers	General Public	Total
Number	28	32	36	96
Age	43.74	45.90	46.47	45.50
Percent Female	29%	13%	36%	26%
Yrs. Experience	20.88	17.63	NA	19.15
College Education	100%	87%	53%	86%
Graduate Degree	25%	16%	25%	24%

RESULTS

Our first objective is to determine whether the SOX provisions increase respondents' perception of auditor independence. A mean response above 0 for each question indicates that respondents, on average, believe the provision increases independence. All of the SOX provisions were perceived by respondents to be associated with greater independence (See Table 2). As such, while the provisions may not have positively improved independence in fact (DeFond & Francis 2005), we find they do significantly improve independence in appearance. However, we suspected that the different groups, although they agreed that the provisions increase independence, may have different opinions about the extent to which each provision increases independence.

Table 2: SOX Independence Question Responses

	CPAs		Loan Officers		General Public	
Questions	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1. All accounting firms conducting audits must undergo quality control reviews.	4.39	1.47	4.09	1.47	4.11	1.53
2. Certain non-audit (i.e., consulting) services will be strictly prohibited.	3.33	1.54	4.34	1.68	4.00	1.67
3. Unless approved by the audit committee, companies will be limited on the amount of non-audit services their auditors can provide.	3.46	1.79	4.23	1.69	3.86	1.61
4. Companies are required to disclose audit and non-audit fees paid to auditors.	3.79	1.32	4.03	1.93	4.47	1.54
5. Auditor firms are required to rotate (change) the partner in charge of the audit on a regular basis.	4.11	1.31	4.34	1.62	4.46	1.34
6. Companies are required to rotate (change) their auditors on a regular basis.	2.93	1.94	3.78	2.04	4.33	1.71
7. No key financial officer of the company is to have been employed by the auditors in the year prior to the audit.	3.61	1.64	4.63	1.56	4.44	1.40
8. Audit committees must be comprised of members not employed by the company they are representing.	4.50	1.48	4.16	1.67	4.81	1.31
9. Audit committees are responsible for appointment, compensation, and oversight of the auditors.	4.68	1.25	3.78	1.68	3.94	1.51
10. A company may not receive tax services from their auditor	1.79	1.66	3.13	1.90	3.69	2.10
11. A board appointed by the government rather than the accounting profession establishes audit regulations.	2.11	1.59	1.88	1.76	3.31	1.98

All responses are significantly greater than 0, $p < .001$
Scales from 0 to 6

Our second hypothesis states that question responses differ between groups. We tested this question with two different methods. First, we determined for each question whether the mean response value differed between groups. Second, we looked at the ranking of question answers for each respondent, and compared the mean ranks across the groups to determine if the groups ranked the questions differently, on average.

A MANOVA test was used to determine whether the overall results differed between the groups, using the groups as the independent factor and the responses to each of the questions as the dependent variables. The MANOVA tests whether the group responses differ across all the questions together. The MANOVA ($F = 3.29$, $p < .001$) indicates that the responses are different between groups, supporting the second hypothesis. We then used ANOVA to find which questions' responses differed between groups (See Table 3). The ANOVA results indicate that differences exist between the group responses in six of the questions. For each of those six questions we conducted a t-test between the mean responses of each of the three groups for each question, as shown in Table 3. The table suggests that both loan officers and the general public differ more from CPAs than from each other. Comparing the CPAs against a combined group of loan officers and general public using MANOVA found a significant difference ($F=4.05$, $p < .001$); comparing loan officers to the general public also finds significant differences ($F=2.63$, $p<.01$). For each question in which the CPA responses are significantly different than the other groups' responses, the CPA response mean is less confident that the SOX provision will improve independence. The lone exception is Question 9, concerning supervision of the audit function by audit committees.

Table 3: Group Differences – ANOVA and t-tests

			T-Scores					
Question	ANOVA F		CPAs vs. Loan Officers		CPAs vs. Public		Loan vs. Public	
1	0.38		ns		ns		ns	
2	2.84	★	2.39	**	ns		ns	
3	1.49		ns		ns		ns	
4	1.49		ns		ns		ns	
5	0.47		ns		ns		ns	
6	4.35	**	ns		3.08	***	ns	
7	3.73	**	2.46	**	2.12	**	ns	
8	1.62		ns		ns		ns	
9	3.00	**	2.32	**	2.08	**	ns	
10	8.06	***	2.89	***	3.95	***	ns	
11	6.18	***	ns		2.61	**	3.13	***

ns: Not significant
*p< .10
**p<.05
***p<.01
Scale ranges from 0 to 6

We also tested if different groups ranked the questions differently. For example, the CPA group gave question 2 a significantly lower score than the loan officer group. But the CPA's tended to give lower responses to all the questions. So how did the CPA's rank question 2 relative to the other questions as compared to the other groups? To determine whether the groups ranked the questions differently, we gave each question a ranking based on each individual's response. The question which received a respondent's highest score was ranked with a 1, and the question that the respondent scored lowest received a rank of 11. For each question, we compared the groups' rankings (Table 4). MANOVA results indicate that the groups ranked the questions differently ($F=3.4$, $p<.001$). The ANOVA results and t-tests for each question shown in Table 4 illustrate a pair of observations. First, as expected from comparing the absolute score differences, CPA opinions vary more from loan officer and general public responses than loan officers and the general public differ from each other. Second, CPAs rate only the influence of reporting to the audit committee significantly higher than the other two groups. The loan officers and the general public tend to rate provisions that limit auditor behavior higher than CPAs rate those provisions, including two provisions not required by SOX: limiting tax services and requiring regular rotation of audit firms. CPAs have relatively less confidence that restrictions on the public accounting industry will increase independence than other parties, and their concerns appear to be reflected in the provisions actually included in the legislation.

Table 4: Mean Ordering of Questions by Group - Question Ranking

Question	CPA	Loan Officers	General Public	ANOVA F
1. All accounting firms conducting audits must undergo quality control reviews.	3.25	4.22	4.31	1.23
2. Certain non-audit (i.e., consulting) services will be strictly prohibited.	5.26	3.34 #	5.31	3.95 **
3. Unless approved by the audit committee, companies will be limited on the amount of non-audit services their auditors can provide.	4.79	4.00 #,^	5.83	2.80 *
4. Companies are required to disclose audit and non-audit fees paid to auditors.	4.90	4.09	3.33	2.01
5. Auditor firms are required to rotate (change) the partner in charge of the audit on a regular basis.	3.82	3.47	3.49	0.15
6. Companies are required to rotate (change) their auditors on a regular basis.	5.86	4.53	3.31 #	4.71 **
7. No key financial officer of the company is to have been employed by the auditors in the year prior to the audit.	5.14	2.56 #	3.64 #	6.13 ***
8. Audit committees must be comprised of members not employed by the company they are representing.	2.68	3.81	2.58	2.24
9. Audit committees are responsible for appointment, compensation, and oversight of the auditors.	2.57	5.06 #	5.22 #	7.51 ***
10. A company may not receive tax services from their	8.07	6.22 #	4.83 #	6.68 ***

Table 4: Mean Ordering of Questions by Group - Question Ranking				
Question	CPA	Loan Officers	General Public	ANOVA F
auditor				
11. A board appointed by the government rather than the accounting profession establishes audit regulations.	7.86	9.00 ^	6.44	4.96 ***

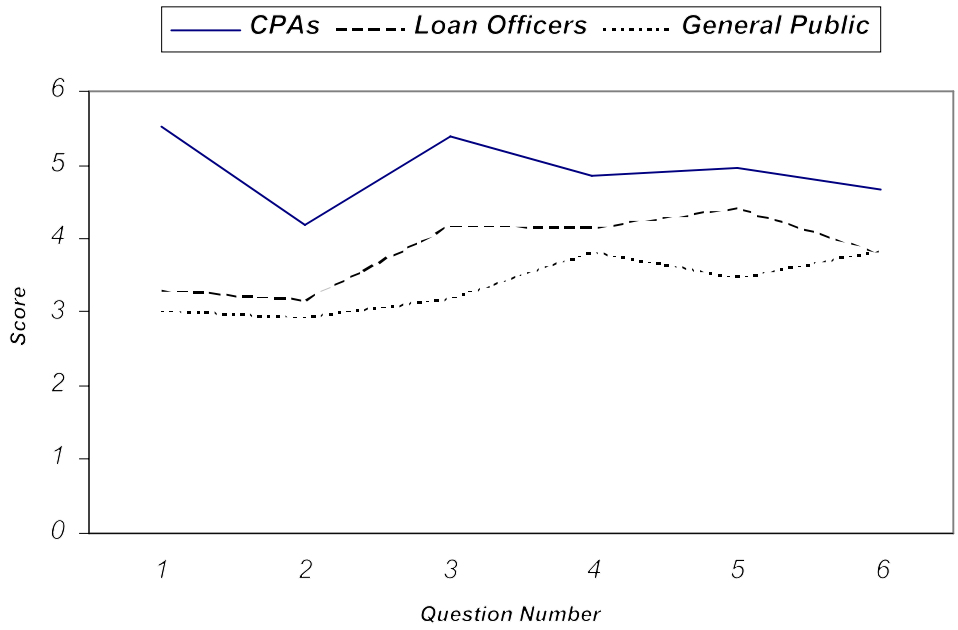
If all participants had given their highest score to a question, that question would have an ordering score of 1.
* p< .10
** p<.05
*** p<.01
# Difference from CPA, p < .05
^ For Loan Officers, difference from General Public p<.05

We also tested several perceptions concerning the adequacy of audit quality. Measures used include overall auditor independence, performance, responsibility, competence, and financial statement reliability. Mean responses are reported in Table 5. Comparisons of group means are illustrated in Figure 1. As with the questions about the independence provisions of SOX, we found a division between groups supporting Hypothesis 3 based on the MANOVA results (F=2.61, p<.05). As further illustrated by the ANOVA results and t-tests in Table 5, the CPA's have greater confidence in the audit process and believe that the audit process is less-biased and that audits are well-conducted than non-CPA's believe in every measure of audit quality. In two questions the general public also displays greater confidence in the audit process than the loan officers. Therefore, the expectation gap between CPA's and users of financial statements continues to exist even after the additional guidance and exposure provided by SOX.

Table 5: Audit Quality Responses			
Questions	CPA Mean	Loan Officer Mean	Public Mean
1. Auditors have the primary responsibility to prevent fraudulent financial reporting.	1.48 *^#	3.72 *	4.00 *
2. Auditors can perform an independent audit when the audit client pays them for non-audit services.	4.19 *^#	3.16	2.92
3. Auditors can give an independent audit if the audit client pays them for that audit.	5.41 *^#	4.16 *#	3.17 ^
4. Most audits are performed well.	4.85 *^#	4.13 *	3.81 *
5. Most financial statements are not materially misstated.	4.96 *^#	4.41 *#	3.47 ^
6. Auditors are properly trained.	4.67 *^#	3.78 *	3.83 *

* p<.05 difference from midpoint of 3
^ p < .05 difference from loan officers
# p <.05 difference from general public
0 = Strongly disagree 6 = Strongly Agree

Figure 1
Graph of Audit Quality Question Responses



Question 1 reverse scored on graph.
High scores indicate a favorable opinion of audits
Response scale from 0 to 6

SUMMARY

Our primary findings are that the Sarbanes-Oxley provisions increase the perception that auditors will be independent from their clients, that auditor's perceptions of the efficacy of the provisions of SOX differ from the perceptions of both sophisticated users of financial statements and the general public, and that an expectations gap regarding audit responsibilities and quality exists between auditors and other groups.

We found that all of the provisions of the Sarbanes-Oxley Act about which we requested information were perceived as improving auditor independence. This was true for auditors, loan officers, and the general public. All three groups rated government regulation of auditing standards as having minimal influence on auditor independence. The CPA responses differed significantly from the non-CPA responses in other questions.

All groups of respondents believe that the SOX provisions enhance independence, but the extent differs, with auditors generally being less confident than other respondents. The order in which the respondents rate the provisions also differs between groups. Non-CPA's are more likely to believe that restrictions on auditors will have a greater influence on independence than CPAs**.** These results are consistent

with the most recent studies involving perceptions of auditor independence (Mishrah, Raghunandan & Rama 2005; Krishnan, Sami & Zhang 2005).

We also find that there is still a significant expectation gap between CPA's and users of financial statements. While it can be argued that the accounting profession did not need to be 'fixed', the continued existence of this gap can be considered support that the public finds SOX as a corrective process for the profession, rather than a formalization of existing policies and procedures.

As we only surveyed a small percentage of the population, there is the possibility of bias being present. Additionally, as respondents were asked to directly report their views, demand effects could be present. Should the various provisions be tested in an experimental study, results could vary. Furthermore, as our results are limited to the respondent's perceptions of the provisions, respondents actual decisions in matters regarding the provisions could vary.

Further research may need to be conducted to determine the long-term effects of the Sarbanes-Oxley Act. For example, has confidence in auditor independence and in financial statement reliability increased as public companies comply with the provisions of the Act? As the provisions in SOX are a relatively new initiative, will the impact shown in this study mitigate over time? As SOX seems to primarily influence independence in appearance, and not independence in fact, will the provisions be effective once the shock of recent scandals fades in time?

ENDNOTES

[i] Pilot testing found some minor difference between the 0-6 scale and a thirteen point scale ranging from-6 to 6 scale with -6 stated as having a detrimental effect on independence rather than no effect. Means significantly differed between the small scale and the larger scale on questions 3, 7, 8, and 11. Questions 3 and 10 were not significantly different than 0. Although some of the specific results differ, we feel that the interpretation of the results is the same using the small or the large scale.

[ii] As with any study relying on survey data, this study is subject to response bias. Additionally, the response rate is subject to difficulties in getting professions to respond due to increasing demands on their time. For a more complete assessment of these difficulties, refer to Schipper (1991).

[iii] The occupations listed of those responding to the general public group were viewed to verify no one in this group was employed as a CPA or Loan Officer.

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IMPACT OF WARRANT LISTINGS ON ITS UNDERLYING STOCKS: THE MALAYSIAN EVIDENCE

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ABSTRACT

This study examines price, systematic risk (beta) and volume changes of underlying stocks surrounding warrant introductions. The sample of study consists of all 96 warranted stocks listed on Bursa Malaysia from year 1999 to 2003. In this study, the price impact is done based on event study method while the systematic risks (beta) and volume impact are done based on regression analysis. Overall, the results indicate that no impact is found on both price and systematic risks of underlying stocks; however, trading volume of underlying stocks does increase due to warrant listings. The outcomes of this study contradict those studies based on stocks options or call warrants where the listing of both derivative products tend to improve the performance of the underlying spot market by producing the positive abnormal returns, increasing the trading volumes and reducing the volatility. Such phenomenon infers that whilst warrants provide an alternative to stock options, they do not expand the opportunity set of investors to the extent that stock options do. Possible explanation might be that Malaysian warrant market is relatively less mature and also differences in Malaysian warrant characteristics. Nonetheless, the interesting evidence found does provide important implications to market participants.

INTRODUCTION

After several years of lacklustre performance, the Malaysian stock market is currently one of Asia's best-performing stock markets. Malaysia has finally drawing strength from attractive valuations and fast-growing economy with more prudent government policies. The Kuala Lumpur Composite Index (KLCI) has risen 52% in the past 12 months. In tandem with the upbeat sentiment, warrants are back in the limelight as rising equity prices on the local bourse is drawing investors' attention to such issues.

Although Bursa Malaysia already has a large number of warrants listed, the research on this exotic derivative instrument is still lacking. Hence, this study is motivated to extract information on the warrant market by documenting and analyzing the impact of warrant listings on the trading behaviour of underlying stocks on Bursa Malaysia. More specifically, this study analyses the behaviour of underlying stocks' price, systematic risk (beta) and volume surrounding the introduction of company-issued warrants.

This study contributes to the literature in several ways. Firstly, existing literatures largely focused on listing impact of options and call warrants and little attention has been given to company-issued warrant. It has been widely accepted that option or call warrant introductions will generally be associated with significant increase in price and liquidity while decline in volatility in the underlying market. Hence, this study is keen to find out the sustainability of these results from the perspective of company-issued warrant

based on the Malaysian environment. Secondly, this study aims to provide warrant issuers an insight regarding the behaviour of underlying stock price, systematic risk and trading volume surrounding the event dates of warrant issues. The preference of an issue will largely depend on how the market quality of the underlying stock is influenced by the warrant introduction. Thus, the results of this study can assist warrant issuers to gain a better understanding of the trading behaviour in underlying stocks surrounding warrant listings and thus enabling them to make informed decisions. Thirdly, there have been some worries that the existence of derivative instruments may increase the volatility of stock returns due to more speculation and hedging activities of traders. Since the Malaysian derivative market is still at its infancy stage, market regulators may use the results of this study as a reference in establishing proper market regulations to ensure the smooth running and healthy development of Malaysian derivative market.

The remainder of this paper is organised as follows. The following section provides an overview of Malaysian warrant market. The third section explains the theoretical background and previous studies. The fourth section describes the data and method employed. The fifth section discusses the empirical results. Finally, the sixth section presents some concluding remarks.

OVERVIEW OF THE MALAYSIAN WARRANT MARKET

Warrant is financial derivatives which 'derive' its value from other assets. The underlying asset may be any asset including a single stock, a basket of stocks, an index, a currency, a commodity or future contracts. Warrant gives the buyer the right, but not the obligations, to buy or sell an underlying asset at a pre-determined price (commonly referred to as the strike price or exercise price) on or before a specified date (commonly referred to as the expiry date or maturity date). Currently, all warrants listed on Bursa Malaysia are on the 'buy side' and are all stock-based (that is, the underlying asset is a stock). In Malaysia, prior to the amendment of Section 57 of the Companies Act 1965, warrants were known as Transferable Subscription Rights (TSRs). With the amendment of the said Act, the term 'TSR' is now obsolete. There are two major types of warrants traded on Bursa Malaysia: call warrants and company-issued warrants (or, simply, warrant).

A call warrant is issued by a third party. The issuer is likely to be an investment bank, or a substantial shareholder of the company. A call warrant does not result in new shares being issued by the company when exercised. However, the issuer will have to supply the shares to the warrant holder who exercises his call warrant. A company – issued warrant is usually issued in conjunction with a fund-raising activity. This type of warrant usually acts as a sweetener in association with a bond or equity issue and normally has an exercise period up to 10 years. Warrants can be either American or European style. An American style warrant can be exercised at any time during the term of the warrant, while an European style warrant can only be exercised on the maturity date. When warrants are exercised, the issuing company satisfies the exercise by issuing new stock to the warrant holders, and hence causes dilution in ownership for existing shareholders. The advantage of such warrants to an investor is the opportunity to share in the future growth of profits of the company, while for the issuing company, the offer of warrants might reduce the rate of interest on a bond issue and may also provide an element of additional capital, if the warrants are exercised. According to Sidek (1990), Consolidated Plantation Berhad was the first Malaysian company to issue warrants in 1980. These warrants expired in 1984, the same year in which the authorities prohibited the issuance of such security by public listed companies. This prohibition was lifted at the beginning of 1990.

Recently, warrant markets in Hong Kong, Taiwan and Singapore have been achieving a stunning growth. In contrast, Malaysia warrant market still lags behind its regional peers. In order to reinforce Malaysia's role as a business hub, a proper development of the warrant market is important for Malaysia because it widens the product breath and deepens the market by generating additional liquidity to the underlying market. As such, the results of this study may serve as a reference for market regulators to come up with appropriate market regulatory framework to ensure a healthy development of the market which is necessary for sustainable growth and long-term success.

LITERATURE REVIEW

Prior empirical results on the impact of option or call warrant listings towards its underlying stocks are mixed. The structure, magnitude or even the direction of these impacts are debatable, but they are potentially of great interest, not only to academics but also to market practitioners and market regulators. Therefore, this study seeks to make contributions by extending the ambit of earlier work by examining the listing impact of company-issued warrants on an emerging market such as Malaysia. In this section, we divided our discussions into theoretical background and previous studies on the related issues in this paper.

Theoretical Background

Option pricing theory, pioneered by Black & Scholes (1973) and further developed by Merton (1973), has accustomed us to think about options are redundant securities. In such setting, the presence or absence of options will have no impact for the riskiness of the financial markets or the volatility of the underlying assets since options provide no new investment opportunity beyond what is available from the underlying assets. Those researchers claim that an investor can replicate the payoff of the option through dynamic trading strategy- a situation in which the option position could be replicated through a portfolio comprising of the stock and riskless bond. Among the assumptions required are the absence of market imperfections like transaction costs or margin requirements, and the ability to sell short with full use of the proceeds. As the assumptions of perfect capital market do not exist in reality, option listing is expected to bring certain impacts towards its underlying asset market. Some researchers suggest that option listings may improve the quality of underlying asset market. Ross (1976) claims that the introduction of options tend to expand the opportunity set of investors by enabling investors to achieve new payoff patterns and thus making the incomplete market more complete. As such, the required rate of return could be reduced and causes an increase in the price of underlying assets. Watt, Yadav & Draper (1992) state that option listings may be followed by greater institutional interest in the stock, greater media coverage and closer scrutiny by analyst and investors. The increase in public information may in turn lower information asymmetry, lower the bid-ask spread and result in declining volatility of the underlying asset. Detemple & Selden (1991) demonstrates that option introductions will enable a more efficient allocation of risks across securities and therefore result in an increased demand for the underlying securities with a consequent decline in spot price volatility. They show, given two classes of investors who disagree on the downside potential of the stock, the introduction of an option increases the equilibrium price of the stock and decreases the volatility of its rate of return. Investors with a high risk assessment sell the stock and buy the option. Investors with a low risk assessment buy more of the stock and sell the option. The net effect is to increase the aggregate demand and price for the

stock, and at the same time the volatility of the stock rate of return decreases. Thus, they conclude that the introduction of an option stabilizes the underlying stock market. Also, the existence of derivatives enable market makers in the underlying stocks to hedge the risk of their portfolio inventory more effectively, which may lead to lower bid-ask spread and greater liquidity in the underlying asset (Gjerde & Saettem, 1995).

On the other hand, some market observers claim that derivative markets may have a destabilizing effect on the underlying market. The rationale behind this argument is that the existence of derivative instruments allows institutional investors to take a large position in both the derivative and the underlying markets to take advantage of price discrepancies. This large volume of trading, in turn, creates price pressures in the underlying market. Furthermore, derivative instruments enable investors to achieve higher leverage gain than if they purely invest in underlying stocks. Hence, it has been argued that the existence of options could in fact cause trading volume to be diverted from the underlying stock to the corresponding option, thereby decreases liquidity (Skinner, 1989). Bollen (1998) claims that if the introduction of option lures significant trading volume away from the underlying stock, the reduction in liquidity might increase the stock's return variance.

Previous Studies

Conrad (1989) examines the impact of option listing during the period from 1974 to 1980 by using a sample of 96 optioned stocks from the Chicago Board of Option Exchange (CBOE) and the American Option Exchange (Amex). Conrad finds that cumulative returns of the underlying stocks remain abnormally high, at least thirty trading days after option listings date. As such, she concludes that option listing on individual stock appears to be associated with a permanent price increase and suggests that options are not completely redundant. Detemple & Jorion (1990) analyze the effect of option listings on stock returns by studying a sample of 300 stocks listed on CBOE and Amex between 1973 and 1986. Comparable to Conrad's results, they find evidence of significant price increase amounts to 2.8% in the optioned stocks around option listings date. They contend that option markets have a real effect on equilibrium prices and allocation. To add into the positive price impact literature is another study conducted by Gjerde & Saettem (1995) based on the Norway market. Their result indicates that option listing is associated with a temporary price increase on the introduction day. Besides options, listing of derivative warrants also tends to demonstrate similar influence towards the underlying stock price. In Hong Kong, by using a sample of 165 call warrants issued between 1989 and 1997 on the Stock Exchange of Hong Kong (SEHK), result from Chen & Wu (2001) is consistent with earlier studies based on Western markets. They, too, find that warrant listings lead to a significant positive and permanent price effect on its underlying stocks. Early study from United Kingdom seems to be consistent with the negative price effect argument. Based on 39 options listed by London Traded Options Market between 1978 and 1989, Watt, Yadav & Draper (1992) observe a steady price decline after option listings. Another study conducted by Kabir (1999) in Netherlands has produced similar evidence. Based on a total of 56 option listings on 47 different stocks from 1978 to 1993, he observes a significant decline in stock prices with option introductions. Besides, some researchers contend that the listing of derivatives tends to send negative signal to the underlying market. In Australia, based on 83 call warrants listed on the Australia Stock Exchange (ASX) between 1991 to 2000, Aitken & Segera (2004) detect a significant negative price decline on the warranted stocks on the announcement date and the first trading date of call warrants.

Based on 327 options listed on CBOE from 1973 to 1986, Haddad & Voorheis (1991) find that there is a decline in total risk after option listings whereas beta remains unchanged. Stucki &Wasserfallen (1994) analyze the effect of options trading on 11 stocks in Switzerland. They find that the introduction of traded options lead to a reduction in the volatility of returns. Utilizing trading data for put and call options written on the S&P index from 1984 to 1993 on CBOE, Chatrath, Ramchander & Song (1995) find that an increase in options trading is followed by a decline in cash market variability. They conclude that their evidence is consistent with the notion that option introductions have a stabilizing influence on cash market. Study from Thailand appears to mirror that of the Western market. Leemakdej (1998) examines 37 warrants listed on the Stock Exchange of Thailand from 1994 to 1997 and concludes that the stock volatility inherently declines after warrant issuance. In contrast, few studies also find that the underlying stocks' volatility is neutral to derivative introduction. Zahari, Briston & Jelic (2002) examine 87 stocks on which warrants have been introduced during 1994 to 1998 on Bursa Malaysia. The results suggest that warrant listings have no real effect upon total risk and systematic risk of the underlying stocks. Finally, Mazouz (2004) investigates 144 option-listed stocks on New York Stock Exchange (NYSE) from 1980 to 2001. The result suggests no risk effect is associated with option listings.

Rao, Tripathy & Dukes (1991) focus on the effect of options trading on underlying over-the-counter stocks. They find that in the long term, stock volume increases, market adjusted variance declines and the bid-ask spread declines following option listing. They conclude that option trading appears to enhance the overall liquidity of the underlying stock. Kumar, Sarin & Shastri (1998) concentrate on 174 optioned stocks listed on CBOE, NYSE, AMEX, PHLX (Philadelphia Stock Exchange), and PSE (Pacific Stock Exchange)from 1983 to 1989.They find that there is a decrease in the spread and increase in quoted depth, trading volume, trading frequency, and transaction size after option listings. In contrast, Alkeback & Hagelin (1998) study 35 warrant introductions on the Stockholm Stock Exchange (StSE). Their results suggest that warrant introductions have no real effect on the trading volume. They claim that decreased liquidity caused by a diversion of trade from the stock to warrant is non-existent.

DATA AND METHOD

This study uses data collected from several sources. Daily prices and Kuala Lumpur Stock Exchange Composite Index (KLCI) are obtained from the Thomson Financial DataStream database, while warrants information are obtained from the Investor Digest, a monthly publication from Bursa Malaysia. The listing date for all securities in the sample is the date that warrants are first issued on the underlying stock. As at December 2003, there are 125 warrants listed on Bursa Malaysia. However, only 96 have been included as the sample of analysis whereas 29 have been excluded due to non-trading during the period of study. Of these companies, 65 are main board companies whereas 31 are second board companies.

Price Impact Analysis

To determine whether the listing of a warrant has an effect on returns, an event study methodology is employed. Common practice in the event study is to separate the estimation window from the event window. The event window (considered the test period) consists of 31 days surrounding the warrant listing

day, i.e. t = -15 to +15, whereby t = 0 is the warrant listing date. The estimation window consists of 161 days of the trading preceding the event window, i.e. t = -176 to -16.

The market model is applied to estimate the daily excess stock returns. It involves the following steps: 1) prediction of "normal" return during the event window in the absence of the event; 2) estimation of the abnormal return within the event window where the abnormal return is defined as the difference between the actual and the expected returns (predicted "normal" returns); and 3) testing whether the abnormal return is statistically different from zero.

The market model assumes a linear relationship between the return of any stocks to the return on the market portfolio:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \qquad (1)$$

where t is the time index, i = 1,2,…,N stands for stocks; R_{it} returns on stock i on period t ; R_{mt} returns on market index during period t, whereby the KLCI has been used as the market index in this study; α_i and β_i are market model parameters and ϵ_{it} is the error term for stock i. The daily return on each of the stock is computed by using the following formula:

$$R_{it} = ln\,(P_{it} / P_{i(t-1)}) \qquad (2)$$

where:

R_{it} = *The return on security i for day t*
P_{it} = *Price of stock i for day t*
$P_{i(t-1)}$ = *Price of stock i for the day before day t*

The daily market return is computed by using the following formula:

$$R_{mt} = ln\,(I_{mt} / I_{m(t-1)}) \qquad (3)$$

where:

R_{mt} = *The return of the market index for day t*
I_{mt} = *Market index for day t*
$I_{m(t-1)}$ = *Market Index for the day before day t*

The market model expected stock return is written as follows:

$$E(R_{it}) = \alpha_i + \beta_i(R_{mt}) \qquad (4)$$

In order to investigate if warrant listing induces any abnormal returns for each stock on each day in the event period, the actual returns are compared with the market model expected returns. The difference between these two returns is interpreted as the abnormal return of a stock.
The abnormal returns for stock i on event day, t, the AR_{it} is computed as follows:

$$AR_{it} = R_{it} - E(R_{it}) \text{ or } AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \qquad (5)$$

where:

R_{it} = *Actual return on stock i for day t*
R_{mt} = *Return on market index for day t*

α_i , β_i = *Ordinary least squares estimations over the estimation window, i.e. t = -176 through -16 preceding the start of the event window.*

After computing the abnormal returns for all securities in the sample, the average abnormal return (AAR_t) is calculated by taking the cross-sectional mean of daily abnormal returns:

$$AAR_t = \frac{Sum\ (AR_{it})}{N} \qquad (6)$$

where:

AR_{it} = *abnormal return of stock i for day t*
N = number of securities in the sample

Cumulative Average Abnormal Return ($CAAR_t$) is calculated after AAR_t is set. Attention should be focused on $CAAR_t$ during the period –1 to +1. Most likely, $CAAR_t$ indicates dramatic changes around that period as compared to others. $CAAR_t$ and AAR_t need to be tested for their statistical significance using the t-test.

The above tests are intended to test the hypotheses as follows:

H1o: There is no significant difference on price of the underlying stock before and after the listing of warrant.

H1: There is significant difference on price of the underlying stock before and after the listing of warrant.

Systematic Risk (Beta) Analysis

In order to determine if a change in beta occurs after the issue date, two betas must be measured for each event: the pre-event beta and the post-event beta. The pre-event beta is the value of the beta prior to the event's occurrence. This is calculated by taking 176 daily returns on the stock before the issue date of warrant by regressing the data against the corresponding daily return on KLCI. Similarly, the post-event beta is the value of the beta after the event's occurrence. It is computed by taking 176 daily returns on the stock after the issue date of warrant by regressing the data against the corresponding daily return on KLCI. The pre-event beta is then compared with the post-event beta.

The value of the stock's beta is determined by the following equation:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it,} \qquad (7)$$

where:

R_{it} = *The return of stock i on day t*
R_{mt} = *The market return of stock i on day t*
α_i = *The constant of stock i*
β_i = *The beta coefficient of stock i*
ϵ_{it} = *The error term*

One readily sees that the beta is the slope of the characteristic line. By utilizing the method of ordinary least squares to find the coefficient α_i and β_i , the error term ϵ_{it} is minimized. Thus, in order to estimate beta, both individual stock returns and the returns on market over the same period of time are needed.

In order to examine the change in beta, the difference of beta for each stock within the sample is obtained.

The difference of beta for stock *i* is determined by:

$$D_i = X_{i,\ pre\text{-}beta} - X_{i,\ post\ beta}$$

After determining the differences of beta for all stocks within the sample, t-test for mean difference is carried out to check for significant difference between the beta of the period before and after the issue of warrant.

The above tests are intended to test the hypotheses as follows:

H2o: There is no significant difference on beta of the underlying stock before and after the listing of warrant.

H2: There is significant difference on beta of the underlying stock before and after the listing of warrant.

Volume Analysis

In order to examine the impact of warrant listings on trading volume of the underlying stocks, the volume of trade for 6 months on either side of the warrant listing date for each company is analyzed. The ratio of the 6 months volume traded after the warrant listing date over the 6 months volume traded before the warrant listing date for each company is compared with the ratio of trading volume in the market as a whole during the relevant periods. Pooled-variance t-test for the difference in two means is used to check for any significant difference in volumes traded before and after the issue of a warrant.

The above tests are intended to test the hypotheses as follows:

H3o: There is no significant difference on volume traded of the underlying stock before and after the listing of warrant.

H3: There is significant difference on volume traded of the underlying stock before and after the listing of warrant.

ANALYSES AND DISCUSSION

Price Impact

In order to determine whether warrant listings has an impact on its underlying stocks' return, an event study with 31 days event window (15 days before warrant listings and 15 days after warrant listings, whereby day 0 as the actual warrant listings day) has been employed. Table 1 reports the average daily abnormal

returns (AARs) and the cumulative average abnormal returns (CAARs) with the associated t-statistics. Column 2 in Table 1 shows the AAR for the 96 stocks (65 main board, 31 second board). From the table, it shows that the majority of AARs within the 31 days event window are negative in number (20 days out of 31 days show negative AAR, >50%). From the analysis, AAR one day before warrant listings is -0.46%, and it manages to improve up to 0.23% on the warrant listings day. However, the positive effect on AAR starts to fade – off on day 1 (0.17%), but manages to pick up on day 2 by producing the AAR of 0.6%. Yet, the trend begins to weaken for the subsequent days. At a level of significance of 5 percent, the t-statistics for AARs with a sample size of 96 are calculated for each of the trading days within the event window. The critical t value for a two–tail test is 1.9853. Since the critical value is greater than the overall t-statistics within the event window (except for day -15, day 7 and day 15), the null hypothesis, which states that warrant listings have no impact on the firms' abnormal return cannot be rejected. As for the CAARs at column 5 , although it manages to slightly pick up on day 0 (the actual listing date), the effect begins to fade-off on day 3. No consistent and permanent price effect shows that warrant listings is not to be associated with price increases/decreases in the underlying stocks, at least not for the 31 days within the event window.

Table 2 reports the number and percentage of companies which experience positive abnormal returns at a given event day. From the table, the average number of firms which experience abnormal returns within the event window is 45, which constitutes 47% of the overall sample. The results demonstrate that less than 50% of firms out perform the market. This further gives an indirect hint that there is no price impact due to warrant introductions. In sum, the results show that the introduction of an additional derivative asset – warrant- does not provide significant additional benefits to market participants.

Systematic Risks (Beta) Impact

In order to determine if a change in beta occurs after the warrant issue date, the pre-event and post-event beta for each of the 96 underlying stocks (65 main board, 31 second board) is calculated by taking 176 daily returns (6 months) before the warrant issue date and 176 daily returns after the warrant issue date and regressing the data against the daily returns from KLCI.

Table 1: Average and cumulative average abnormal returns and their respective t-statistics around warrant listings.

Event Day	AAR	Standard Deviation	AAR (t-stat)	CAAR	CAAR (t-stat)
Day-15	-0.6848%	0.0255	-2.6335**	-0.6848%	-10.1228**
Day -14	0.1261%	0.0302	0.4099	-0.5587%	13.4136**
Day -13	0.2474%	0.0309	0.7840	-0.3112%	37.0248**
Day -12	-0.2989%	0.0309	-0.9805	-0.6102%	11.8429**
Day -11	0.2256%	0.0323	0.6842	-0.3846%	5.5678**
Day -10	-0.1289%	0.0315	-0.4006	-0.5134%	15.1854**
Day -9	-0.7096%	0.0446	-1.5591	-1.2230%	-4.9458**
Day -8	-0.1483%	0.0507	-0.2864	-1.3714%	-4.3348**
Day -7	-0.2276%	0.0337	-0.6621	-1.5989%	-3.6441**

Table 1: Average and cumulative average abnormal returns and their respective t-statistics around warrant listings.

Event Day	AAR	Standard Deviation	AAR (t-stat)	CAAR	CAAR (t-stat)
Day -6	-0.3493%	0.0332	-1.0306	-1.9482%	-2.9281**
Day -5	-0.1014%	0.0301	-0.3302	-2.0496%	-2.7701**
Day -4	-0.1076%	0.0378	-0.2787	-2.1572%	-2.6201**
Day -3	0.1717%	0.0352	0.4773	-1.9855%	-2.8679**
Day-2	0.1095%	0.0296	0.3622	-1.8760%	-3.0521**
Day -1	-0.4571%	0.0445	-1.0067	-2.3331%	-2.4069**
Day 0	0.2308%	0.0353	0.6411	-2.1023%	-2.6945**
Day 1	0.1666%	0.0340	0.4795	-1.9357%	-2.9489**
Day 2	0.5999%	0.0423	1.3896	-1.3358%	-4.4672**
Day 3	-0.0747%	0.0407	-0.1798	-1.4105%	-4.1980**
Day 4	-0.0229%	0.0379	-0.0592	-1.4334%	-4.1219**
Day 5	-0.0864%	0.0420	-0.2013	-1.5198%	-3.8580**
Day 6	-0.2546%	0.0410	-0.6080	-1.7743%	-3.2455**
Day 7	-1.5350%	0.0402	-3.7409**	-3.3093%	-1.6583
Day 8	0.2800%	0.0416	0.6595	-3.0293%	-1.8207
Day 9	-0.3402%	0.0337	-0.9889	-3.3695%	-1.6271
Day 10	-0.2837%	0.0384	-0.7240	-3.6532%	-1.4945
Day 11	0.3885%	0.0325	1.1702	-3.2647%	-1.6822
Day 12	0.1402%	0.0468	0.2936	-3.1245%	-1.7620
Day 13	-0.6436%	0.0368	-1.7129	-3.7682%	-1.4468
Day 14	-0.5334%	0.0355	-1.4737	-4.3016%	-1.2600
Day 15	-0.9892%	0.0367	-2.6428**	-5.2908%	-1.0165

** significant at 5% level

Table 2: Number and percentage of companies with positive abnormal returns at event days

Event Day	Number of Firms	*Percent > 0
Day -15	36	38%
Day -14	50	52%
Day -13	47	49%
Day -12	41	43%
Day -11	50	52%
Day -10	43	45%
Day -9	48	50%

Table 2: Number and percentage of companies with positive abnormal returns at event days		
Event Day	Number of Firms	*Percent > 0
Day -8	49	51%
Day -7	45	47%
Day -6	47	49%
Day -5	46	48%
Day -4	50	52%
Day -3	40	42%
Day -2	50	52%
Day -1	46	48%
Day 0	48	50%
Day 1	45	47%
Day 2	46	48%
Day 3	52	54%
Day 4	51	53%
Day 5	52	54%
Day 6	44	46%
Day 7	31	32%
Day 8	47	49%
Day 9	45	47%
Day 10	38	40%
Day 11	49	51%
Day 12	44	46%
Day 13	43	45%
Day 14	42	44%
Day 15	34	35%
Mean	45	47%
*This refers to the percentage of companies with positive abnormal returns at a given event day		

Table 3: Results of beta before and after warrant listings				
	Companies with Beta < 0	Companies with 0<Beta<1	Companies with Beta >1	Total
Pre warrant listings	5	32	59	96
Post warrant listings	3	35	58	96

The results of beta computation before and after warrant listings are shown in Table 3. From the table, prior to warrant listings, there are 5 companies with beta less than 0, 32 companies with beta between 0 and 1 and 59 companies with beta greater than 1. After the listings, the companies with a beta less than 0 reduced to 3, while there are more companies with beta between 0 and 1 at 35, as opposed to 32, before warrant listings and a slight decline from 59 to 58 in the number of companies with beta greater than 1.

Table 4: Results of paired-samples t-test for beta before and after warrant listings

Mean D_i	Standard Deviation	t-Statistic	t-Critical	Result
0.0476	0.5554	0.8394	1.9852	Cannot reject null hypothesis

Using 96 samples and 95 degrees of freedom, the mean of difference D_i between the pre and post betas is 0.0476, and the standard deviation is 0.5554. At a level of significance of 5 percent, the t- statistic calculated is 0.8394. The critical t value for a two –tail test is 1.9852. Since the critical value is greater than the t-statistic, there is no evidence supporting that a difference does indeed exist between pre and post betas over the entire sample. Thus, the null hypothesis, which states that warrant listings have no impact on the firm's beta, cannot be rejected. Table 4 summarizes the results of the paired-samples t-test.

Volume Impact

In order to examine the impact of warrant listings on trading volume of the underlying stocks, the volume of trade for 6 months on either side of the warrant listing date for each company is analyzed. This is done by calculating the ratio of the 6 months volume traded after the warrant listing date over the 6 months volume traded before the warrant listing date for each company. The ratio obtained is then compared with the ratio of trading volume in the market as a whole during the relevant periods.

The results indicate that out of 96 companies, 54 experienced an increase in trading activity and 42 experienced a decline in trading volumes after warrant listings. On the other hand the analysis of movements in overall market volumes during the 6 months before and after the issue of the warrant suggests that warrant listings do have impact over the general market movements. The results of comparison of the changes in trading volume of the stocks concerned relative to changes in overall market volume show a marked tendency for increased volume after the issue of a warrant. Based on the analysis, there are 53 companies reporting an increase in trading volume relative to the overall market while 43 experiencing a decline.

Table 5: Results of pooled-variance t-test for the difference in two means

Underlying stocks mean	Market mean	Standard Deviation	t-Statistic	t-Critical	Result
3.4314	0.9686	1.8439	3.4	1.9725	Reject null hypothesis

Using 96 samples of trading volume of underlying stocks and 96 samples of trading volume of the overall market, with 190 degrees of freedom and 1.8439 standard deviation, the mean obtained are 3.4314

(for underlying stocks) and 0.9686 (for market). At a level of significance of 5 percent, the t-statistic calculated is 3.4. The critical t value for a two–tail test is 1.9725. Since the critical value is smaller than the t-statistic, there is enough evidence supporting that a difference does indeed exist between the trading volumes of market and underlying stocks over the entire sample. The result can be interpreted as the listing of warrants does have a positive impact over the firms' trading volume. Thus, the null hypothesis, which states that warrant listings have no impact on the firm's trading volume, can be rejected. Table 5 summarizes the results of the pooled-variance t-test for the difference in two means.

CONCLUSION

Overall, evidence obtained from this study indicates that warrant listings possess insignificant impact on both price and systematic risk of Bursa Malaysia's underlying stocks. However, the analysis of volume impact does show that trading activities of underlying stocks improve after warrant listings.

The outcomes of this study contradict those studies based on stocks options or call warrants where the listing of both derivative products tend to improve the performance of the underlying spot market by producing the positive abnormal returns, increasing the trading volumes and reducing the volatility. Such phenomenon infers that whilst warrants provide an alternative to stock options, they do not expand the opportunity set of investors to the extent that stock options do. This could have been attributed to difference in characteristics between traded options and call warrants, on which much of the research in other markets are based. Another explanation is that lower market participant rate in Malaysian warrant market as compared to stock market can be considered as one of the contributing factors.

The present study only focuses on company-issued warranta nd examination of the impact of new innovative warrant types on the spot market (e.g. those covering the movement for a basket of equities or index) are desirable ias one of the ways to explore the unknown world of Malaysian derivative market.

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MANDATORY AUDIT FIRM ROTATION: EVIDENCE FROM ILLINOIS STATE UNIVERSITIES

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ABSTRACT

A component of the Sarbanes-Oxley Act required the GAO to survey financial statement stakeholders to evaluate the key issues regarding mandatory audit firm rotation. The State of Illinois legislates that all government agencies change auditors every six years. This unique environment provides the opportunity to investigate audit behavior given mandatory audit firm rotation. This research analyzes audit findings using the sample of all Illinois state universities governed by the Illinois Auditor General's audit firm rotation program. By examining a mandated audit firm rotation program, new evidence is obtained to add to this debate.

The results of this research indicate that more audit findings are reported in the first year under the new auditor. It may be that a fresh look initiates different audit findings or that auditors are more rigorous in the first year of an audit. Also, the fewest number of findings are reported in the last year of the audit prior to mandatory audit firm rotation. This suggests that either the auditor is less diligent in the last year or that over the course of the auditor's tenure, the university was able to correct prior audit findings. Finally, there is evidence that findings increase with the new auditor, which contradicts the proposition that the university has improved all of its systems and supports the idea that a fresh look is provided by the new auditor. Regardless of the interpretation, audit results differ over the course of the mandated audit cycle. More research is needed to determine the specific reasons for these differences.

INTRODUCTION

This paper examines auditor's findings when audit firm rotation is predetermined and mandated. Section 207 of the Sarbanes-Oxley Act of 2002 commissioned the General Accounting Office (GAO) to conduct a study of audit firm rotation. That report, issued in November of 2003, identified strengths and weaknesses of mandatory audit firm rotation as specified by the various constituencies, but made no specific recommendations. Instead, it suggested that the SEC monitor the effectiveness of other provisions of SOX and revisit the role of mandatory audit firm rotation at a later date if necessary.

The State of Illinois requires all of its agencies to be audited annually by the Illinois State Auditor General who hires special assistant auditors. The special assistant auditors are external, independent certified public accountants who conduct financial and compliance audits of the state agencies. By law, each agency must change special assistant audit firms every six years. This provides a unique opportunity to investigate the behavior of auditors in a mandatory audit firm rotation environment.

The State of Illinois issues a report summarizing the results of the financial audit including the number of findings, the number of repeat findings, and a brief description of the most significant findings. Data for fiscal years ending June 30, 1994 through 2005 from these Report Digests were obtained from the Illinois Office of the Auditor General for each of the nine Illinois state universities. There were thirteen full audit cycles to compare amongst the nine universities.

The number of audit findings throughout the audit firm rotation cycle is investigated. In general, auditors have more audit findings in the first year of the audit and the least number of findings in the final year. When the new auditor is appointed, the number of findings again increases. This suggests that audit findings differ within the rotation cycle.

This paper is organized as follows. First audit firm rotation will be examined and the hypotheses are developed. Next, a summary of the Illinois State Audit Act is presented. This is followed by a description of the sample, the results, and then our final conclusions.

AUDIT FIRM ROTATION

Audit firm rotation has been debated for decades as a possible solution to auditor independence problems (Blough, 1951; Seidman, 1967; the Metcalf Report (US Senate,1977)). Most recently, the Sarbanes-Oxley Act required the Comptroller General to conduct a study of the potential effects of mandatory rotation of auditing firms, bringing audit firm rotation once again to the forefront. In November, 2003, the GAO submitted its report to the Senate Committee on Banking, Housing, and Urban Affairs and the House Committee on Financial Services. The GAO report synthesized the views of proponents and opponents of mandatory audit firm rotation that have been consistently debated for almost a century. The 5 main arguments are summarized in Table 1.

Table 1: GAO's Summary of Arguments Regarding Audit firm rotation

Proponent's argument	Opponent's counter argument
Long-term relationships increase audit risk failures	Short-term relationships increase audit risk
Increases Public Confidence	Cost Exceeds Benefit
Non-U.S. companies require audit firm rotation	Non-U.S. countries still have audit failures
Creates a fresh look at the company's audit	The PCAOB provides a fresh look
Creates a competitive market for audit firms	Reduces available firms capable of providing service

The conflict between the two sides centers for the most part on the quality of the audit services provided. Proponents argue that entrenchment will result in audit quality declining as audit tenure increases. Opponents of audit firm rotation argue that the familiarity with the client increases audit quality. The GAO report surveyed auditors, corporate accountants, and audit committee members. The results of the study indicated that no group supported audit firm rotation. In general, it was felt that the costs would exceed possible benefits. Additionally, they perceived the potential audit problems in the early years of an audit as being more significant than the probability of an audit failure related to increased audit tenure. The stakeholders responded that they did not feel the comfort level of the auditor nor the familiarity of the client

with audit procedures would increase the likelihood of an audit failure. Conversely, the unfamiliarity with the client's operations in early years was cited as a potential problem that could result in increased audit risk. The results of the survey led the GAO to the conclusion that:

> *We believe that mandatory audit firm rotation may not be the most efficient way to enhance auditor independence and audit quality considering the additional financial costs and the loss of institutional knowledge of a public company's previous auditor of record. (page 8, GAO)*

Not only was the Committee concerned with the cost/benefit tradeoffs of audit firm rotation, but they also took into consideration the new requirements of SOX. Several of the SOX requirements were designed to enhance auditor independence and quality, so the Committee's final observation was:

> *. . . we believe that more experience needs to be gained with the act's requirements. Therefore, the most prudent course at this time is for the SEC and the PCAOB to monitor and evaluate the effectiveness of the act's requirements to determine whether further revisions, including mandatory audit firm rotation, may be needed to enhance auditor independence and audit quality to protect the public interest. (page 5, GAO)*

Given this renewed focus on audit firm rotation, several academic studies have been conducted to examine audit firm tenure, generally focusing on audit quality defined in various ways. Deis and Giroux (1996, 1992) investigate the relationship among audit fees, audit hours, auditor tenure, and audit quality for audits of Texas school districts. In Texas, the State issues a quality control review of the school district's auditors and analysis of these letters provides their measure of quality. They find that auditors provide higher quality audits in the first two years of the audit. They restrict their sample to small, local auditing firms.

Jennings, et. al. (2006) examine the perception of auditor independence and legal liability. Judges were given scenarios involving audit partner rotation or audit firm rotation. In addition, levels of corporate governance were manipulated. Judges perceive that audit firm rotation increases independence. In addition, it interacts with corporate governance. If corporate governance is strong, there is little difference in the perceived liability of the auditor if a fraud is detected. On the other hand, if corporate governance is minimally compliant, then firm rotation greatly reduces the perceived liability of the auditor. Taken together, then, these two studies support audit firm rotation.

A second line of research on audit tenure uses discretionary accruals to proxy for audit quality. These tend to find higher audit quality in the later years of the audit. Myers, et. al., (2003) examine over 2,600 firm-years and control for firm size, industry, and growth. They find that higher audit quality (lower discretionary accruals) is associated with longer auditor tenure. In addition, less extreme accruals are associated with longer auditor tenure. This would discount the proponent's view that audit risk increases with the longer term relationship. These results are confirmed in a study by Johnson, et. al. (2002) that looks more specifically at the break points in the quality/tenure relationship. They use the absolute value of unexpected accruals and the persistence of accruals. They partition their sample of over 11,000 firm-years into those with auditor tenures of 1-3 years, 4-8 years, and 9 or more years. They find that earnings quality is reduced with shorter audit tenures, confirming the results of Myers, et. al. (2003). There is no significant difference between the

medium and long-term audit groups. Finally, Gul, et. al. (2007) find an interaction among auditor tenure, independence, and size. Using a sample of over 4,700 firms, they determine that clients with shorter auditor tenures again reported more positive discretionary accruals but this is also associated with more nonaudit fees paid to the auditor. This result is especially significant for small audit clients.

All of these prior studies examined situations where auditor change is voluntary. While some studies examine mandatory auditor changes in the case of audit firm discontinuation (Nagy, 2005; Reed, et. al., 2007), the current study examines a scenario where audit firm rotation is dictated at the time the engagement is initially accepted. This is more in line with what Congress and the GAO report were suggesting. By examining this sample, we are able to contrast the issues raised by auditors in the early years of the audit and well as what happens in the final year when the audit firm knows it can not be retained in the future. Also, unlike the prior studies, the number of audit findings is the dependent variable. This is similar to the Deis and Giroux (1996, 1992) metric and is a more direct measure of audit results than discretionary accruals.

RESEARCH QUESTIONS

One main argument against mandatory audit firm rotation is that there is a significant learning curve for each client. Therefore, in early years, the auditor will not be as effective as in later years. Proponents of audit firm rotation argue that the fresh eyes that the auditor brings to a new audit will enhance audit effectiveness. The results of prior research are mixed.

In later years, opponents to audit firm rotation suggest that audit effectiveness will be enhanced as the audit firm becomes more experienced with the client's operations. Alternatively, proponents of rotation argue that auditor independence is compromised as the auditor becomes more entrenched and the client becomes more familiar with the audit processes. No study has been conducted where the change is mandatory and predictable, so it is unclear what will happen in later years, so again, a direction is not hypothesized.

Therefore, the first hypothesis does not suggest a direction. Instead, we hypothesize that the number of audit findings differs over the course of the audit cycle. In addition, if the auditor becomes complacent in later years and/or the new auditor focuses on different issues, then it is expected that the number of audit findings will increase with a new auditor.

ILLINOIS STATE AUDIT ACT

The State of Illinois requires all of its agencies to be audited annually under the Illinois State Audit Act. This Act was initially passed in 1957 and created the Department of Audits and the Legislative Audit Committee. In 1977, the increase in the number of audits needed and the time constraints of the Auditor General's office prompted an amendment to the Act to allow for the hiring of special assistant auditors. Special assistant auditors are external, independent certified public accountants hired by the Illinois Audit General to conduct financial and compliance audits of the state agencies. Currently all the state universities are audited by public accounting firms reporting to the Auditor General.

The hiring process is conducted through a bid process and is mandated by the Illinois Procurement Code. The bid process reduces the impact of audit costs and fees on the due diligence performed during the course of the audit cycle. Any fees paid to the audit firm are set before any work begins, and the audit firms must keep the bids low in order to obtain the universities as a client. Additionally, the rotation program

specifies a six year maximum for audit services from one individual audit firm; therefore the rotation schedule is generally set at the time the bid is accepted.

An important distinction exists between the state audits and corporate audits. The Illinois Audit Act specifies that the audit workpapers prepared by special assistant auditors are the property of the State. Therefore, newly hired audit firms have complete access to the details of previous audit findings. Accordingly, the start-up costs of the new audit firm may not be as high as those incurred if mandatory audit firm rotation was required for public company audits.

SAMPLE

The sample consists of the nine public universities governed by the State of Illinois. The State of Illinois issues Report Digests summarizing the results of each audit by the number of findings, a brief description of the most significant findings, and the number of repeat findings. The most recent twelve years of Report Digests were obtained from the Illinois Office of the Auditor General for each of the nine universities. The Report Digests from fiscal years ending June 30, 1994 through 2005 were examined yielding a total of 108 audit-years.

In this time period, there were thirteen full audit cycles to compare amongst the nine universities. Although a rotation policy is set for every six years, there were four cases where the cycle was only four years. This was done to establish a staggered rotation schedule across universities to ease the burden of the Illinois Auditor General=s coordinating the bid process for all nine universities in the same fiscal year. Fourteen different audit firms are represented.

RESULTS

The data are analyzed in two phases. First, the behavior of the auditor during the audit cycle is examined, and then the behavior of the predecessor and successor auditor is contrasted.

During the Audit Cycle

The mean number of findings and the number of repeat findings is shown on Table 2. As the table shows, the number of both findings and repeat findings decreases over the course of the audit cycle. Matched-pairs t-tests determined that the difference between the findings in the first and last year of the audit is significant. For findings, the t-statistic is 2.52, (p-value= .013), and for repeat findings it is 2.11 (p-value= .028). The number of findings goes down over the course of the audit cycle.

Next, we investigate whether the size of audit firm contributes to the magnitude of the difference. Firms were divided into the national firms and smaller firms. (There were not enough observations to classify Big 4 as a group.) The general linear models technique was conducted contrasting the number of audit findings by audit size and year of audit. When all six years are included, the model is not significant (Table 3).

Table 2: Findings over Life Cycle of Audit		
Year	Findings	Repeat Findings
1	7.85	3.31
2	6.15	2.08
3	5.56	2.33
4	4.56	2.22
5	4.77	1.46
6	3.08	1.08

Table 3: Audit Findings Across All Six Years					
General Linear Model Results					
Source	DF	Sum of Squares	Mean Square	F-Value	Prob of F
Audit Size	1	27	27	1.19	.28
Year	5	165	33	1.44	.22
Model	6	192	32	1.4	.23
Error		63	1,446	23	
Correct Total	69	1,638			

However, when only the first and last year of the audit are contrasted, the year is significant even after controlling for auditor size (Table 4).

Table 4: Audit Findings in the First and Last Year of Audit					
General Linear Model Results					
Source	DF	Sum of Squares	Mean Square	F-Value	Prob of F
Audit Size	1	1.94	1.94	.07	.79
Year	5	148	148	5.41	.03
Model	2	150	75	2.75	.09
Error	23	629	27		
Correct Total	25	778			

The results indicate that near the end of the audit firm rotation cycle, fewer findings are disclosed. The may be the result of a fresh look at the beginning of the cycle and/or systematic improvements over the course of the audit, or it may be that auditors become less rigorous as the audit nears termination.

Audit Change Years

Next, we examine the behavior of the successor auditor relative to the predecessor auditor. If it were the case that the new auditor brings a new perspective to the audit, we would expect more audit findings by the new auditor. On the other hand, if clients improved processes over the course of the prior audit, then the new auditor may not have additional audit findings. With regard to repeat findings, we would not expect the same relationship. Repeat findings should go down or remain the same as the auditor changes.

The results of t-tests contrasting the findings before and after the auditor change are shown in Table 5. There were twenty auditor changes over the period investigated. Of this group, the average number of findings the year before a change was 4.95 while the number cited by the new auditor was 6.45, which is significant. Additionally, there is no significant difference in the repeat findings across the two groups. While this research does not attempt to evaluate the merit of the specific audit findings, since the number of findings does increase significantly in the year of the change, the results suggest that the new auditor brings a different perspective to the audit.

Table 5: Difference between Predecessor's and Successor's Number of Findings

(20Changes)

	Mean # of Findings	Mean # of Repeat Findings
Findings Before Change	4.95	1.75
Findings After Change	6.45	2.20
t-test	2.17	.93
two-tailed p-value	.04	.36

The type of replacement auditor is tested next. The difference between the number of findings in the last year of the predecessor auditor and the first year of the successor auditor was computed. Universities changing to small auditors were contrasted to those moving to large audit firms. As shown in Table 6, the number of findings increases in the first year when a large auditor is appointed, though the difference is marginally significant (p=.07). It does not appear to make any difference if the prior auditor was large or small (Panel B). The number of audit findings increases if the new auditor represents a large firm.

Table 6: Mean Difference between Predecessor's and Successor's Number of Findings

Partitioned by Auditor Size

(20 Changes)

	From Small Auditor	From Large Auditor	Overall Mean
To Small Auditor	1.67 (N=6)	-.33 (N=6)	.67
To Large Auditor	5.50 (N=2)	1.83 (N=6)	2.75
Overall Mean	2.63	.75	

Table 6: Mean Difference between Predecessor's and Successor's Number of Findings			
Panel A – New Auditor is Large Auditor?			
Yes (N=8)	2.75		
No (N=12)	.67		
t-test	1.53		
one-tailed p-value	.07		
Panel B - Stayed with Same Size Auditor?			
Yes (N=12)	1.75		
No (N=8)	1.125		
t-test	.38		
one-tailed p-value	.36		

LIMITATIONS BASED ON NATURE OF SAMPLE

The findings of the auditors are systematically different over the life cycle of the audit. While the State of Illinois provides an environment in which to examine mandatory audit firm rotation, some caveats must be noted. For example, the audit workpapers are the property of the State and the subsequent auditor has full access to those documents. This may decrease inconsistencies between audit findings of different auditors. The availability of prior workpapers should increase the continuity during the audit change and may be something to consider requiring if audit firm rotation should become mandatory for corporate audits.

In addition, the bid process may impact the auditor's behavior. The audit fee for the entire audit cycle is established at the time the bid is accepted. Also, the lowest bid must be accepted. This may impact the hours devoted to the audit which may be reflected in the audit findings. In this bid environment, it is unlikely that auditors would low-ball in the first year with the intent of increasing fees in subsequent years. Even if mandatory audit firm rotation was implemented for corporate audits, these restrictions would probably not be integrated. Therefore, in corporate situations where fees could vary each year, the pattern of audit findings may differ from that reported here.

CONCLUSION

In a situation where audit firm rotation is required at least every six years, this research indicates that audit findings decrease over the course of the audit. This corresponds to the results of prior research that found higher quality audits in the earlier years, but contradicts the results of studies using discretionary accruals as a proxy for quality. The current study also examined the final phase of an audit where audit firm rotation is mandatory. The number of findings is significantly lower in the last year of the audit relative to the first year. Finally, we contrast the findings of the prior auditor with those in the year of the change. Audit findings increase especially when the new auditor is a large audit firm.

Additional agencies need to be examined and more research is necessary to further identify the advantages and disadvantages of audit firm rotation. Also, by examining other states, it may be possible to

identify differences between mandatory versus unscheduled auditor changes for state supported agencies. Other states also have different laws regarding the custody of workpapers, and this may be a fruitful area of investigation. However, the results of this study suggest that audit firm rotation may be beneficial. While we did not investigate the quality of the audit findings, it seems the replacement auditors provide a fresh look at the audit since they identify new issues for the client to address.

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