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Dennis Chambers
Kennesaw State University, dchamb17@kennesaw.edu

Jeff L. Payne
University of Kentucky

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Audit Quality and Accrual Persistence: Evidence from the Pre- and Post-Sarbanes-Oxley Periods

Dennis Chambers, Ph.D.[a]

Jeff Payne, Ph.D.[b]

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[a] Coles College of Business, School of Accountancy, Kennesaw State University, 1000 Chastain Road, Kennesaw, GA, 30144-5591, dchamb17@kennesaw.edu, (770) 423-6375, fax: (770) 499-3420.

[b] (Corresponding Author) Von Allmen School of Accountancy, University of Kentucky, 355 Gatton B&E Building, Lexington, KY 40506-0034, jpayn4@email.uky.edu

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Abstract

Purpose – The purpose of this paper is two-fold: first, to examine whether the quality of accruals, as measured by accrual persistence, improved in the post-SOX period, and second, to examine the degree to which SOX-related improvement in accrual persistence varies across companies depending on the degree of their auditor's independence.

Design/methodology/approach – The paper compares accrual persistence in the pre- and post-SOX periods to test the first question. Then, partitioning on relative client importance as a measure of auditor independence, the paper compares the SOX-based improvement for clients of low and high independence audit firms.

Findings – The study first demonstrates that accrual persistence increased significantly in the post-SOX period. The study also finds evidence that in the post-SOX period, the subsample of companies audited by Big-N auditors with lower-independence experienced the greatest improvement in accrual persistence.

Originality/value – This is the first paper to evaluate SOX-related improvements in the quality of earnings as measured by accrual persistence. Prior studies test abnormal accruals and other earnings management metrics, however, persistence is a more general test of financial statement quality. This study also is the first to compare SOX-related improvements for clients of firms with differing levels of independence.

Keywords Sarbanes-Oxley, audit quality, auditor independence, accruals, persistence

Paper type Research paper

1. Introduction

A series of events occurred in the period after 2001 that potentially had the effect of improving the quality of reported financial information. Following the "dot-com" bust, a number of high-profile audit failures (e.g., Enron and WorldCom), the prosecution and subsequent demise of Arthur Andersen, and the passage of landmark regulatory legislation in the form of the Sarbanes-Oxley Act of 2002 (hereafter, SOX) created both *de facto* and *de jure* changes in the financial reporting environment. In this study, we address two research questions. First, did the quality of accruals (measured by accrual persistence) improve in the post-2001 period (hereafter, the post-SOX period)? Second, if accrual quality improved in the post-SOX period, did this improvement vary depending on the level of pre-SOX auditor independence?

The first question, dealing with the SOX-era environment, is somewhat controversial with divided views among the public, corporate management, auditors, and government leaders. Business leaders have been outspoken in their criticism of SOX, asserting that compliance added significant costs for minimal benefits. Many have been quick to dismiss SOX as unnecessary and overly burdensome, even going so far as to deem it "quack corporate governance" (Romano 2005). Concurrent research finds that opportunistic earnings management, proxied using absolute levels of abnormal accruals, declined in the post-SOX period (Carcello, Hollingsworth, and Mastrolia 2009; Cohen, Dey, and Lys 2008; and Lobo and Zhou 2006). This behavior was accompanied in the post-SOX period by a reduced propensity of reported earnings to just meet or beat analysts' forecasts (Bartov and Cohen 2009), potentially indicating companies are less likely to engage in opportunistic earnings management. However, Cohen et al. (2008) and Bartov and Cohen (2009) find a concurrent increase in the use of real earnings management techniques to adjust reported financial statement balances after the passage of SOX. They note that these techniques are more costly to implement, yet less likely to be considered opportunistic if detected by investors and auditors. These findings raise the possibility that in the post-SOX period companies may be merely shifting to less detectable earnings management techniques rather than reducing earnings management per se.

In this study, unlike the prior published studies, we are interested in SOX-related improvements in accrual quality in general and not specifically a reduction or shifting in opportunistic earnings management. We measure relative accrual quality by estimating the persistence of total accruals. Total accruals include short-term, long-term, and financial accruals, providing a broader approach than one using just operating accruals, allowing an extension to the prior literature dominated by abnormal accrual metrics.

Prior accounting research has often used earnings persistence as a proxy for earnings quality (e.g., Beneish and Vargus 2002 and Richardson 2003). The conceptual basis for this link is an argument that higher quality earnings are those that are more sustainable (see Revsine et al. 1999, pp. 224-225 and Bodie et al. 2002, p. 628). Earnings and accrual persistence are a measure of the degree to which current earnings or accruals are sustained in the future. Schipper and Vincent (2003) argue that earnings persistence can be an indicator of decision usefulness—the predominant quality characteristic advocated by the Financial Accounting Standards Board. Prior research has also linked higher earnings persistence to higher investor response to earnings information (Kormendi and Lipe 1987). Investors place a higher valuation multiple on earnings that are expected to persist in the future. In this sense, investors judge more persistent earnings to be of higher quality.

Measuring accrual quality using persistence also takes a broader view of the sources of lower quality including both intentional (opportunistic and real) manipulation and unintentional measurement error in accruals. This approach allows us to examine the full complement of decision choices available for management regarding their response to SOX era reforms.

Our second question examines potential differences in the effect of SOX-era reforms on reporting quality, depending on the level of auditor independence. Recent studies have raised concerns regarding auditors' incentives with respect to management's reporting decisions. The prior literature, which focused on audit-quality measures that imply auditor competence, may not provide evidence on the negative effect of impaired independence on financial reporting quality, even in the presence of auditor ability. The inconsistent evidence (some report reduced, other report increased, abnormal accruals) from the literature examining the influence of non-audit service fees on auditor independence is indicative of this (DeFond, Raghunandan, and Subramanyam 2002; Frankel, Johnson, and Nelson 2002; Ashbaugh, LaFond, and Mayhew 2003; Krishnan, Sami, and Zhang 2005; Francis and Ke 2006). Prior studies have examined audit quality in the pre-SOX (Lim and Tan 2008) and post-SOX (e.g., Cohen et al. 2008; Ashbaugh-Skaife et al. 2009) periods separately. To our knowledge we are the first to compare the effects of SOX depending on the level of auditor independence.[1]

We construct a sample of audit-client companies over two time periods: 1998 through 2001 comprising the pre-SOX period and 2003 through 2006 comprising the post-SOX period. This sample is composed of 18,451 company-years audited by Big-N audit firms.[2] We first examine the persistence of accruals in the pre- and post-SOX periods by comparing accrual persistence in each period, with controls for a variety of non-SOX drivers of accrual persistence.

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[1] Lobo et al. (2006) find that companies with weaker corporate governance experienced greater improvement due to SOX than companies with stronger governance.

[2] We use the term "Big-N" to represent audit firms generally included in the Big-6, Big-5, and Big-4 during the years of our sample period. This includes Arthur Andersen, Ernst & Young, Pricewaterhousecoopers (PriceWaterhouse and Coopers and Lybrand pre 1998), Deloitte, and KPMG. Prior research (e.g., Reynolds and Francis 2001) likewise limit their investigation to only Big-N firms.

We find that accrual persistence is significantly higher in the post-SOX period. This finding is consistent with a SOX era-related increase in accrual quality.

We then partition the entire sample of audit-client companies into high- and low-auditor-independence groups based on a measure of audit-firm independence used in prior literature (e.g., Reynolds and Francis 2001). We compare accrual persistence across this partition. We then test if the post-SOX improvement in accrual persistence differs between our auditor independence groups. We expect significantly greater SOX-related improvement in accrual persistence for low-independence groups, compared to high-independence groups. We base this expectation on the intended effects of the various SOX-era reforms as well as the general reporting environment in the post-SOX period. As expected, we find that the post-SOX improvement is significantly greater for the low independence sub-samples when compared to the high independence groups.

This study contributes to the SOX and audit-quality literatures in a number of ways. First, we demonstrate a link between SOX-era reforms and higher accrual persistence for Big-N audited companies. This is consistent with prior literature that measures accrual quality using abnormal accruals only.[3] Second, we provide evidence that SOX-related improvements in accrual persistence varies by level of auditor independence. The greatest SOX-related improvements occur for clients with less independent auditors pre-SOX. This provides some evidence that an objective that motivated the passage of SOX, improving auditor independence, was achieved, when measured using our metric for financial statement quality, accrual persistence.

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[3] Concurrent research using data from the post-SOX period indicates that improvements in internal controls, potentially motivated by Section 404 disclosures of material weakness in the system of internal controls over financial reporting (e.g., Ashbaugh-Skaife et al. 2009) and executive certification of financial statements (Carcello et al. 2009), lead to reduced abnormal accruals. Our research extends this result by contemporaneously examining the pre- and post-SOX periods and a broader measure of financial statement quality, accrual persistence.

We note, that like many other empirical studies that investigate the impact of SOX era reforms (Carcello et al. 2009; Cohen et al. 2008; Lobo and Zhou 2006) that we cannot definitively state that the changes we document in financial reporting behavior are solely from the passage of SOX and the other changes in the auditing environment in that period. Many other factors (e.g., increased auditor and investor prudence) were in a state of fluctuation during the post SOX period that might influence decisions affected reported financial statements.

We organize the paper as follows. Section 2 contains background discussion and hypothesis development. Section 3 contains the sample selection process and reports descriptive statistics. Section 4 contains research design and results for tests of the effect of the post-SOX period on accrual persistence. Section 5 contains research design, results, and sensitivity analyses for the tests of the effect of audit quality on accrual persistence and tests of whether SOX-related improvement in persistence depends on audit quality. Section 6 contains concluding comments.

2. Background and Hypothesis Development

2.1 The Sarbanes-Oxley Act of 2002

The passage of the Sarbanes-Oxley Act (SOX) led to dramatic changes to existing audit and financial reporting regulations (e.g., Sections 302 and 404), with the intention of improving the quality of audited financial statements and the quality of auditing services. In addition, the auditing environment appears to have changed dramatically during the period that SOX was enacted and implemented (McConnell and Banks 2003; Koehn and Del Vecchio 2004; Ciesielski and Weirich 2006). A variety of related contemporaneous events such as increased audit fees, the demise of Arthur Andersen, and greater public scrutiny of auditors and public companies served to potentially increase the independence of auditors and the quality of reported accruals. While many question the benefits of SOX (Romano 2005), existing research indicates that SOX era reforms have affected managerial decision-making in general (Cohen, Dey, and Lys 2005; Cohen et al. 2008), and more specifically with regard to using abnormal accruals to adjust financial statement presentation (Carcello et al. 2009; Cohen et al. 2008; and Lobo and Zhou 2006). To extend this research we investigate the influence of the SOX era on financial reporting quality by examining the persistence of reported accruals, a more complete measure of accrual quality. Based on prior research, we expect the persistence of accruals to improve in the post-SOX period when compared to the period before the implementation of SOX. Stated formally:

H1. The persistence of accruals will be significantly greater in the post-SOX period compared to the pre-SOX period.

Note, however, that Cohen et al. (2008) and Bartov and Cohen (2009) find the use of real earnings management techniques to alter reported financial statement balances increased after the passage of SOX. This provides an alternative outcome for H1. If real earnings management activity substitutes for prior use of abnormal accruals to opportunistically adjust financial statement balances then accrual persistence could decrease or remain unchanged in the post-SOX period. Unlike prior studies that compare the level of abnormal accruals before and after SOX, by examining accrual persistence, we are able to account for reductions in financial reporting quality due to real earnings management activities.

2.2 Audit quality and the effect of SOX

It seems reasonable that relative audit quality will influence the degree to which the events surrounding and following enactment of SOX affected accrual quality. One would expect that companies that received high quality audits before the SOX period would see less improvement in financial reporting quality due to SOX-era reforms than companies with lower quality audits. This should be particularly true for audit quality issues directly targeted by the SOX reforms, such as auditor independence.

A quality audit occurs when a skilled and independent audit firm is able to identify accounting misstatements and exert pressure on the client to correct those misstatements (DeAngelo 1981). As a result of reducing accounting misstatements, the audited financial statements exhibit higher quality. However, as a practical matter, the achievement of this ideal depends both on the competence of the auditor to find accounting misstatements, and on the firm's willingness to exercise its influence over the client to correct misstatements. DeAngelo (1981) suggests the client-auditor association is a bilateral monopoly that motivates auditors to compromise their independence in order to retain clients. Therefore, if a particular client represents a large proportion of an audit firm's total revenue, the audit firm may be less willing to exert influence on client reporting choices (Reynolds and Francis, 2001; Francis and Yu, 2009). Ghosh, Kallapur, and Moon (2009) find evidence that suggest investors are concerned about perceived auditor independence, measured as a reduced earnings response coefficient, using audit fees as a proxy for the level of a client's importance to the auditing firm.

Based on prior research investigating settings where auditors obtain a significant proportion of audit revenues from one client, we suggest that auditor independence is potentially impaired and auditor willingness to correct misstatements is diminished. In this setting, the audit firm's desire to retain a client that represents a significant economic asset for the firm, leads to reduced auditor independence (Reynolds & Francis 2001).

In order to indicate auditor independence, we use a measure of the proportion of the total office-specific audit fees earned from a particular audit client. This measure of client influence is estimated by the ratio of the client's audit fees to the total audit fees earned by the audit firm in the same office.[4] Specifically, a high (low) influence measures indicate potentially impaired (unimpaired) auditor independence.[5]

There are several reasons to suggest that client specific influence is related to client-specific independence and audit reporting decisions. First, for clients that represent a significant amount of a firm-office's audit-fee revenue, firms will tend to act in a way that preserves that revenue. This idea was suggested by the Cohen Commission Report which states "When one or a few large clients supply a significant portion of the total fees of a public accounting firm, the firm will have greater difficulty in maintaining its independence." (AICPA, 1978**).**

Firms with significant revenues from individual clients are likely to have the competence to identify general and industry-specific misstatements. However, impaired independence due to the economic pressures of retaining this client may reduce the firm's willingness to influence the client to correct the misstatements. The result of uncorrected accounting misstatements would be audited accruals with lower quality.

As mentioned earlier, many of the provisions of SOX were directed toward improving audit quality by increasing auditor independence, specifically the ban on non-audit services and the implementation of a direct communication channel with the audit committee allowing auditors to bypass management in their discussions of potentially contentious financial reporting and control issues. In the post-SOX era, the audit committee hires the audit firm, not company management or the Board of Directors. Therefore, the effect of SOX may be to improve the independence of audit firms. As previously discussed, the SOX era reforms had dramatic effects on the auditing marketplace. The provisions of SOX were intended to improve the quality of all audits.

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[4]Audit fees are often proxied using client size in prior research (Simunic 1980). We adopt this proxy as well because for much of our sample period audit fee data is not available from Audit Analytics.

[5] Note that this does not imply that the competence of the auditor is lacking, just their willingness to adjust financial reports for misstatements. .

However, we expect this effect to be greater for audits performed by less independent audit firms. If SOX encourages all firms to reach the same audit quality level, these firms will have more room for improvement. We investigate this question by testing whether the SOX-related improvement is greater for companies with auditors with lower levels of independence. Stated formally:

> *H2*. Reported accruals audited by firms with lower levels of independence will have a greater increase in persistence from the pre-SOX to the post-SOX periods than those audited by audit firms with higher levels of independence.

3. Data and Sample Selection

We first obtain data from the 2006 and 2007 COMPUSTAT databases over the data years 1997 through 2007. All NYSE/AMEX/NASDAQ companies with available industry information (COMPUSTAT item "DNUM"), audit-firm information (Compustat item 149), and total sales (item 12) in these data years are included in the calculation of proxies for auditor independence and audit-firm industry specialization. We limit our sample to Big-N firms to be consistent with prior literature using similar metrics to determine auditor independence and specialization. Because actual audit fee data has limited availability for the pre-SOX period, we use the client company-year's total sales (natural log) to proxy for audit revenue (Reynolds and Francis 2001). We calculate the natural log form of total sales by industry, by auditor, by city, by auditor within industries and by auditor within cities.

We form a dichotomous variable, *IND*, designed to measure audit-firm independence. We construct *IND* by calculating an influence measure used in prior research, first by Reynolds and Francis (2001). This measure (INFLUENCE), calculated for each client/auditor combination, is the company's sales divided by the sum of sales of each publicly-listed company audited by an audit firm office.[6] We use the natural log of sales in our calculations given its high correlation with actual audit fees (Craswell et al., 1995; Simunic 1980) which were not publicly available during some of our sample years. This allows us to determine the economic importance of a client based on the proportional magnitude of its fees relative to total fees of the publicly traded companies audited by an individual audit firm office.

Prior studies indicate that actual audit fees paid to (or, in the case of our proxy, the total client sales audited by) an auditor is a reliable measure for auditor reliance, or economic dependence, on a client or particular industry (Simunic 1984; Reynolds & Francis 2001; Chung & Kallapur 2003). We define a high (low) independence audit firm as one that has an INFLUENCE measure in the lower three (top) quartiles. *IND* is coded one when *INFLUENCE* is in the lower three quartiles indicating unimpaired independence, whereas *IND* is coded zero when INFLUENCE is in the top quartile, indicating potentially impaired independence.

To control for audit firm specialization, we construct a control variable for industry specialization (*SPEC*) as follows. We first calculate the audit firm's share of the company-year's two-digit SIC industry (e.g., Audit Firm A audited 26% of total company sales in two-digit SIC industry 50 in 1999). Following Palmrose (1986, p 104), we define industry specialists as audit firms that have a market share of at least 120 percent of an equal division of market share among the Big N firms existing at that time. Specifically, when the audit firm's market share is greater than 1/6*1.2 (20%) for 1997, 1/5*1.2 (24%) for 1998-2000, or 1/4*1.2 (30%) for 2003-2006, *SPEC* is coded one, and zero otherwise. This method has the advantage that it controls for the consolidation of the Big N firms from six in 1997 to four in 2002. To ensure that the relationship between audit firm and client-company is well established at the beginning of the fiscal year, we

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[6] We base our estimate of audit-firm office-specific fee revenue by totaling estimated audit fees earned in a single metropolitan statistical area (MSA) which should be a good approximation of the service area of an individual audit-firm office.

assign each company-year the *SPEC*, metric calculated for that company's auditor in the prior fiscal year.[7]

We then screen sample company-years for required financial statement data in the prior, current and subsequent years. *Earnings* is equal to income before extraordinary items (COMPUSTAT item 18), scaled by average total assets (item 6). Total accruals (*TACC*) is equal to the change in total assets (item 6), minus the change in cash and short-term investments (item 1), plus the change in short-term investments (item 193), minus the changes in total liabilities (item 181) and preferred stock (item 130), all scaled by average total assets (item 6). Cash flows (*CF*) is equal to *Earnings*, less *TACC*.

In order to construct an unambiguous test of the relative accrual quality between groups of companies and between the pre- and post-SOX periods using accrual persistence coefficients, it will be important to control for other determinants of accrual persistence that may systematically differ across groups of companies and across time.[8] Dechow and Dichev (2002) discuss a number of company-specific characteristics that are likely to be associated with accrual persistence, likely to be affected by contemporaneous events, but unrelated to the effect of SOX or the role of auditors in detecting reporting errors and misstatements. Based on their study, we define six variables designed to control for company-specific characteristics and contemporaneous events that may affect accrual persistence. First, company-years with different operating cycles are more likely to have differing accrual persistence. *OPCYCLE* is the sample

[7] An additional benefit of using lagged audit quality is that is provides some assurance that the direction of causation is from audit quality to accrual persistence and not the reverse.

[8] Since sample company-years experienced both SOX and contemporaneous events simultaneously, and the events affected all companies in the economy simultaneously, it is not possible to control for a particular contemporaneous event itself, such as the 9/11 terrorist attacks and the subsequent recession. However, it is possible to control for the effect of those unrelated contemporaneous events on reported accruals.

company's operating cycle, in days. Following Dechow and Dichev (2002), *OPCYCLE* is calculated as follows:

$$OPCYCLE = \left[\frac{(AR_t + AR_{t-1})/2}{Sales/360}\right] + \left[\frac{(Inv_t + Inv_{t-1})/2}{COGS/360}\right] \quad (1)$$

Where *AR* is accounts receivable (COMPUSTAT item 151), *Inv* is inventory (item 3), and *COGS* is cost of goods sold (item 41). Second, smaller companies are more likely to have lower accrual persistence compared to larger companies that have more stable and diversified operations. *SIZE* is equal to the square root of total assets (this measure of company size is aligned with our proxy for audit fees). Third, company-years with greater sales volatility are likely to have lower accrual persistence. *SVOL* measures volatility in reported sales. *SVOL* is the standard deviation of sales (item 12) scaled by average total assets (item 6) over four years. Fourth, and for the same reasons, company-years with greater cash flow volatility are likely to have lower accrual persistence. *CFVOL* measures the volatility of cash flows; it is equal to the standard deviation of operating cash flows (item 308) scaled by total assets. Finally, company-years reporting losses are likely experiencing a severe negative shock in their operating environment. Accruals made in response to these conditions likely involve lower accrual persistence. *LOSS* is a dummy variable coded one if *Earnings* is less than zero and coded zero otherwise. Dechow and Dichev (2002) find evidence that each of these characteristics, to varying degrees, is associated with accrual quality.[9] In addition to the characteristics suggested by Dechow and Dichev, we expect that a company's relative riskiness may affect the persistence of their accruals. Therefore, we will also control for book-to-market ratio as a general measure of company-specific risk (Fama and French 1993). *BM* is equal to book-to-market ratio at fiscal-year-end.

[9] Dechow and Dichev (2002) identify three additional variables that affect accrual quality: accrual volatility, earnings volatility, and accrual magnitude. We do not control for these variables because, unlike the variables we adopt, they measure characteristics of accruals themselves rather than non-accrual characteristics that might affect accruals persistence. Including these three variables would inappropriately control for the hypothesized relations; this would amount to "throwing the baby out with the bathwater."

Overall, our data requirements yield a sample of 18,451 company-years, representing 4,439 companies, over the periods 1998 through 2001 and 2003 through 2006. Yearly subsamples range from 1,516 in 2006 to 2,793 in 1999.[10]

Table I, panel A contains distributional statistics for the study variables. The mean (median) company's earnings represent -1.8 (3.5) percent of total assets, while mean (median) total accruals equal 4.0 (3.1) percent of assets. Mean *Earnings* are slightly negative, reflecting the skewing effects of extreme negative observations. Mean *IND* of 0.793 indicates that 79.3 percent of sample companies are audited by independent audit firms. In the same way, mean *SPEC* of 0.272 indicates that 27.2 percent of the sample companies are audited by industry specialists. Mean *LOSS* of 0.300 means that 30.0 percent of the sample companies reported negative net income.

Table I, panel B contains variable means calculated in the pre- and post-SOX period. *CF* and *TACC* are not significantly different in the pre- and post-SOX periods, while *Earnings* are significantly higher in the post-SOX period. *IND* is significantly higher in the post-SOX period (0.748 versus 0.855, t = 11.29); however, the economic significance of that difference is questionable. Each of the mean control variables is significantly different in the post-SOX period. These significant differences reinforce the importance of controlling for these company-specific characteristics in our regressions.

Table II contains Pearson and Spearman correlations between the study variables, along with p-values in parentheses. Pearson correlations are reported above the diagonal and Spearman below. Most of the correlations are statistically significant, but very low. The correlations between *Earnings* in period t+1 and both *CF* and *TACC* are positive, as expected. This is

[10] These sample sizes are calculated after removing observations judged to be excessively influential based on large HAT variables (greater than 0.007) generated from estimating the two regression models described below. Including some or all of these outliers causes great instability in estimated coefficients.

consistent with prior studies that find both CF and TACC reflect positive persistence with respect to one-year-ahead earnings (e.g., Sloan 1996). Consistent with prior research and with the role of accruals, the correlation between *CF* and *TACC* is significantly negative. As expected, *IND* and *SPEC* are negatively correlated, indicating the importance of controlling for industry specialization using *SPEC*. Not surprisingly, *LOSS* is negatively correlated with one-year-ahead *Earnings*, *CF*, and *TACC*. *LOSS* is also negatively correlated with *SIZE*. Cash flow volatility, *CFVOL*, is negatively correlated with *CF* and positively correlated with *LOSS*. *SIZE* is negatively correlated with both cash flow and sales volatility, which confirms our intuition that larger firms will have less volatile economic environments.

4. Tests of the effect of SOX on accrual persistence

4.1 Research design

We test *H1* by estimating a pooled regression of one-year-ahead *Earnings* on current *CF* and *TACC*, with separate coefficients estimated pre-SOX and post-SOX for audit clients. We then compare the pre- and post-SOX accrual persistence coefficients. We expect the persistence of accruals will be greater in the post-SOX period for both sets of companies.

$$\begin{aligned} Earnings_{t+1} &= \alpha_0 + D_{pre}\left(\alpha_1^{pre} CF_t + \alpha_2^{pre} TACC_t\right) + D_{post}\left(\alpha_1^{post} CF_t + \alpha_2^{post} TACC_t\right) \\ &\quad + \sum\nolimits_{k=2}^{7} \alpha_{k+1}\left(Control_k \times TACC_t\right) + \varepsilon \end{aligned} \tag{2}$$

The dummy variable D_{pre} is equal to one if the year equals 1998 through 2001, and zero otherwise. Similarly, D_{post} is equal to one if the year equals 2003 through 2006, and zero otherwise. As described in the previous section, accrual persistence can differ between firms due to economic factors that may systematically differ in the pre- and post-SOX periods. Therefore, we include six control variables that interact with *TACC* to control for non-SOX-related persistence differences.[11] Based on Dechow and Dichev (2002), we would expect the coefficient on the *SIZE* interaction to be positive, while the other five control-variable coefficients would be negative. However, because a number of these control variables are correlated with one another, these univariate predictions may not hold; therefore, no formal predictions are made about the direction or magnitude of the control-variable coefficients.

The *CF* coefficients $\left(\alpha_1^{pre} \text{ and } \alpha_1^{post}\right)$ measure the persistence of cash flows with respect to one-year-ahead *Earnings*. Similarly, the *TACC* coefficients $\left(\alpha_2^{pre} \text{and } \alpha_2^{post}\right)$ measure the persistence of accruals. *H1* will be supported if $\alpha_2^{post} > \alpha_2^{pre}$.

4.2 Results

Table III reports the results from estimating regression (2). The table reports two versions of this regression; the first set of results excludes the control variables while the second set includes them. The post-SOX accrual coefficient (α_2^{post}) is significantly greater than the pre-SOX coefficient (α_2^{pre}) in both the uncontrolled and controlled versions of the regression (t-statistics of 3.78 and 3.44, respectively).[12] This finding supports *H1*; the persistence of accruals significantly increased in the post-SOX period, compared to the pre-SOX period, after controlling for other sources of differential persistence.[13]

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[11] We do not include a control for *SPEC* in this regression because its purpose is to control for industry specialization when using the *IND* variable which is not used in regression (2). We convert the five continuous control variables to fractional ranks before interacting them with *TACC*. Using fractional ranks (that range from zero to one) allow interpretation of the interaction coefficients as incremental persistence coefficients.

[12] The study sample may contain up to 15 company-year observations from a single company. Correlations between these observations violate independence assumptions of OLS. In addition, the sample is significantly heteroskedastic ($\chi^2 = 406.19$, $p < 0.0001$). Therefore, the t-statistics reported in Table III, and the rest of the study, are corrected for both heteroskedasticity and for lack of within-company independence in the study sample. These Huber-White t-statistics are calculated based on Diggle et al. (1994). In untabulated results described in the sensitivity analysis section, we re-estimated our t-statistics simultaneously controlling for non-independence both within companies and within years (i.e., two-way clustering). All inferences are unchanged using this more strict control for non-independence.

[13] Interestingly, the cash flow coefficient is also significantly greater in the post-SOX period compared to the pre-SOX period. This implies that economic conditions in the post-SOX period caused cash flow persistence to increase. This raises the question of whether the same economic conditions caused the increase in accruals persistence rather than the hypothesized improvement in reporting quality. We test the significance of the difference between the improvement in accrual and cash flow persistence for

We next examine the efficacy of our control variables. In the uncontrolled regression, the coefficients on *TACC* are smaller than the *CF* coefficients. This is consistent with the results in prior studies, particularly Sloan (1996) and Richardson et al. (2005). This difference reverses when we add the control variables to the regression. This is not surprising because these variables are controlling for the economic factors that cause the persistence of accruals to be lower than that of cash flows. Five of the six control variables have statistically significant coefficients. Only *SIZE* has a coefficient in the opposite direction expected.

5. Audit quality, accrual persistence, and the effect of SOX

5.1 Descriptive statistics

Table IV reports comparative means across the *IND* groups. The differences in mean *Earnings*, *SPEC*, *LOSS*, *CFVOL*, *SVOL*, *OPCYCLE* and *SIZE* are significantly different for the two *IND* groups. The significant differences in the control variable means in each of the panels demonstrate the importance of controlling for these economic drivers of accrual persistence when comparing accrual persistence across *IND* groups.

5.2 Research design

We estimate the following pooled regression to measure the effect of *IND* on accrual persistence separately in the pre- and post-SOX periods.

$$\begin{aligned} Earnings_{t+1} = \gamma_0 &+ D_{pre}\left(\gamma_1^{pre} CF_t + \gamma_2^{pre} TACC_t + \gamma_3^{pre} IND_{t-1} \times TACC_t\right) + \\ & D_{post}\left(\gamma_1^{post} CF_t + \gamma_2^{post} TACC_t + \gamma_3^{post} IND_{t-1} \times TACC_t\right) \\ & + \sum_{k=1}^{7} \gamma_{k+3}\left(Control_k \times TACC_t\right) + \varepsilon \end{aligned} \tag{3}$$

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the controlled regression. The improvement in accrual persistence is significantly greater than the improvement in cash flow persistence (0.056, , t-statistic = 2.18). This should not be the case if the improvement in the persistence of each comes from the same economic cause.

Regression (3) once again tests for differences in accrual persistence in the pre- and post-SOX periods. The addition of interaction variables for auditor independence allows separate tests for companies audited by high- and low-independence auditors. The coefficients on the interaction *IND* × *TACC* (γ_3^{pre} and γ_3^{post}) measure the incremental accrual persistence for the high-*IND* groups, compared to the low groups The coefficients on *TACC* (γ_2^{pre} and γ_2^{post}) can be interpreted as accrual persistence for the low-*IND* group. The difference $\gamma_2^{post} - \gamma_2^{pre}$ measures the SOX-related improvement in accrual persistence for the companies audited by low-independence auditors. Similarly, the difference $(\gamma_2^{pre} + \gamma_3^{pre}) - (\gamma_2^{post} + \gamma_3^{post})$ measures the SOX-related improvement in accrual persistence for companies audited by high-independence auditors. We can re-test *H1* separately for low-independence and high-independence groups by testing these coefficient differences.

We test *H2* by comparing the difference in the improvement in accrual persistence, due to SOX, between the low- and high-*IND* groups; we test $\gamma_2^{post} - \gamma_2^{pre} = (\gamma_2^{post} + \gamma_3^{post}) - (\gamma_2^{pre} + \gamma_3^{pre})$.

5.3 Results

Table V reports the results of estimating regression (3). We first report the results from re-testing *H1* separately for the low-independence and high-independence groups. *H1* is supported for both groups (0.212 and 0.107, t-statistics = 5.20 and 3.09, respectively). These results demonstrate the robustness of the *H1* test reported for regression (2).

H2 predicts that the SOX-related improvement in accrual persistence will be significantly greater for the low-*IND* group compared to the high-*IND* group. We find significant support for *H2*, with the low-*IND* increase in persistence being 0.105 (t-statistic = 2.43) greater than the high-*IND* increase in persistence. These results are consistent with significantly greater SOX-related improvement in accrual quality for clients of audit firms classified as low-independence firms.

Overall, the results from estimating regressions (2) and (3) provide evidence that the quality of accruals improved in the post-SOX period, but occurs disproportionately in companies audited by audit firms with potentially impaired independence in the pre-SOX period. These results are consistent with the intentions stated in SOX of improving the quality of audits and increasing the quality of financial reporting.

5.4 Sensitivity analyses

We consider a number of additional analyses to further understand the scope of the results reported above. We first examine whether our results are driven by sample companies switching between Big-N and non Big-N audit firms. During the period in which SOX was being implemented, significant market changes were occurring that resulted in a large number of former Big-N clients moving to non Big-N auditors. We re-estimate both regression (2) and regression (3) for the subsample of companies that did not switch between Big-N and non Big-N auditors during the years 1997 through 2007. In no case are the inferences using this restricted sample different from those reported in Table III and V. Therefore, our main analysis is supported for this subsample.

We next consider whether the relationship between material weakness disclosures required under Sections 302 and 404 of SOX and abnormal accruals discussed in prior and concurrent research (e.g., Ashbaugh-Skaife et al. 2009, see additional citations in footnote three) is the main explanation for our results. To test the degree to which the presence or the remediation of reported material weaknesses are driving our results, we exclude observations from companies that reported a material weakness adverse opinion in any year. This results in a sample size of 16,397 observations. The inferences from these analyses are the same as in our main results. Therefore, we conclude that our main results are not primarily driven by the presence or remediation of material weaknesses identified in post-SOX period.

We next examine the sensitivity of our results to an alternate method of calculating our t-statistics. In our primary analyses we report Huber-White t-statistics that control for correlations between observations from the same company across years. However, the standard errors on which our t-statistics are based may be biased downward due to cross-correlations between observations within the same fiscal year. In order to control for cross correlation within years and within companies, it is necessary to simultaneously control for clustering on both dimensions. We examine the effect on our hypothesis tests of potential within-year cross-correlation by re-estimating each of our hypothesis tests using standard errors that control for both within-year and within-company correlations.[14] *H1* and *H2* are similar to the reported tests (*H1*: t=5.04, *H2*: t=2.74).

We next re-test H1 by estimating the volatility of residuals produced by estimating regression (3). We estimate residual volatilities in a manner similar to Dechow and Dichev (2002). Company-specific standard deviations of residuals were estimated separately in the pre- and post-SOX period. In untabulated results, mean residual standard deviations were significantly smaller in the post-SOX period compared to the pre-SOX period (t-statistic of 8.20). These results are consistent with H1. We then partition the set of company-specific standard deviations into those with different audit-firm independence. The reduction in residual

[14] The procedure used to produce these standard errors is suggested in Petersen (2009). The SAS code we used was written by John McInnis and is available at: http://myweb.uiowa.edu/jmcinnis/sas_code.htm

volatility is approximately the same for the low-independence group compared to the high-independence group. These results are inconsistent with H2.[15]

We also explored the possibility that the time period we choose is unique and that our results would change if other years were selected. Our main analysis uses observations from two sets of four years: 1998 through 2001 and 2003 through 2006. This sample includes one problematic year, 2001, when the economy felt the effects of 9/11. We repeat our analysis using 1997 through 2000 as our pre-SOX sample. The results using this alternate sample are essentially identical to those reported in Tables III and V.

It is also possible that our results could occur because of a change in the composition of total accruals rather than because of our hypothesized relations. For example, in the pre-SOX period total accruals could be composed of relatively more working-capital accruals and less long-term accruals while the opposite is true in the post-SOX period. Such a change in relative composition of total accruals could cause an apparent change in the persistence of total accruals that is unrelated to SOX. We determine the extent to which this affects our results by re-estimating equations (2) and (3) using accruals disaggregated into three components: Working capital accruals, non-current operating accruals, and financial accruals. Disaggregating accruals in this way should control for changes in the relative composition of total accruals. We find support for *H1* in all three components. We find support for *H2* in two of the three components. We obviously have no predictions in our study of which components of accruals will be more affected by audit quality or SOX. However, finding support for our hypotheses for at least one component provides evidence that differential accrual composition is not driving our results.

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[15] The measurement of residual volatilities in this method may introduce noise that is driving the lack of support for H2. Due to the fact that our pre- and post-SOX periods are just 4 years each, and to the effects of 4-way partitioning on IND and Pre- versus Post, the variances were estimated over as few as two observations for some firms.

Larger companies (those with market capitalization above $70 Million), were required to implement the requirements of SOX earlier than smaller companies. Therefore, one would expect the results of our study to be more strongly observed in the large subsample. Consistent with that expectation, H1 is strongly supported for the large accelerated filers, but not for the smaller companies. Interestingly, H2 continues to be supported for both groups, but with marginal significance—possibly due to the loss of statistical power because of the partitioning of the sample.

Finally, we re-estimate our main regressions making a variety of changes in the sample or the design. We re-estimate the regressions after eliminating companies that were ever audited by Arthur Andersen, excluded the control for SPEC, and included all main effects for the interactions. In no case were the inferences from our hypothesis tests affected.

6. Conclusion

In this study we answer two research questions. First, did the quality of accruals improve in the post-SOX period? We find evidence consistent with an improvement in accrual quality in the post-SOX period. Second, does the extent of post-SOX improvement in accrual quality differ between clients of auditors with low- and high-independence? We find evidence that companies audited by auditors classified as having lower-independence experienced the greatest improvement in accrual quality in the post-SOX period.

These findings represent a significant extension of prior studies examining possible financial reporting benefits from SOX. Our use of accrual persistence, rather than abnormal accruals, to test our hypotheses allowed us to demonstrate a net improvement in financial reporting quality, despite the previous findings that real earnings management increased in the post-SOX period. Prior studies were not designed to allow the effect of higher real earnings management to affect their tests of accrual quality.

Several potential limitations to the study should be kept in mind when considering our results. First, due to lack of actual audit fee data over both the pre- and post-SOX periods, we use total sales as a proxy for audit fees. While this and prior studies have demonstrated a high correlation between audit fees and total sales, it is possible that our proxy measures audit fees with error. Second, since there has been only a short time period since implementation of SOX, our post-SOX results may not reflect the long-term effects of the post-SOX environment. Future studies can evaluate the generalizability of our results when more years of post-SOX data become available. Finally, the post-SOX period was characterized by a number of changes to the economy aside from those affecting the audit environment. It is possible that despite the controls used in our main and supplemental analyses that some other omitted variable is driving our results. A similar limitation is noted in concurrent and prior research investigating the influence of SOX era reforms on managements use of abnormal accruals (Carcello et al. 2009; Cohen et al. 2008; Lobo and Zhou 2006).

References

American Institute of Certified Public Accountants (AICPA). (1978), “Commission on auditors' responsibilities: Report, conclusions, and recommendations (Cohen Commission)”, New York, NY: AICPA

Ashbaugh, H., LaFond, R., & Mayhew, B. W. (2003), "Do nonaudit services compromise auditor independence? Further evidence", *Accounting Review*, Vol. 78 No. 3, pp. 611-639.

Ashbaugh-Skaife, H., Collins, D. W., Kinney, W., & Lafond, R. (2009), "The effect of sox internal control deficiencies on firm risk and cost of equity", *Journal of Accounting Research*, Vol. 47 No. 1, pp. 1-43.

Bartov, E. L. I., & Cohen, D. A. (2009), "The "Numbers game" In the pre- and post-sarbanes-oxley eras", *Journal of Accounting, Auditing & Finance*, Vol. 24 No. 4, pp. 505-534.

Beneish, M. D. & Vargus, M. E. (2002), “Insider trading, earnings quality, and accrual mispricing”, *The Accounting Review*, Vol. 77, No. 4, pp. 755-791.

Bodie, Z., Kaine, A., & Marcus, A. J. (2002), *Investments*, 6th ed., McGraw-Hill, New York, NY.

Carcello, J. V., Hollingsworth, C., & Mastrolia, S. (2009). The effect of PCAOB inspections on Big 4 audit quality. University of Tennessee.

Chung, H., & Kallapur, S. (2003), "Client importance, nonaudit services, and abnormal accruals", *Accounting Review*, Vol. 78 No. 4, pp. 931-955.

Ciesielski, J. T., & Weirich, T. R. (2006), "Ups and downs of audit fees since the sarbanes-oxley act", *The CPA Journal*, Vol. 76 No. 10, pp. 28.

Cohen, D. A., Dey, A., & Lys, T. (2005). The sarbanes oxley act of 2002: Implications for compensation structure and risk-taking incentives of ceos. New York University.

Cohen, D. A., Dey, A., & Lys, T. Z. (2008), "Real and accrual-based earnings management in the pre- and post-sarbanes oxley periods", *The Accounting Review*, Vol. 83 No. 3, pp. 757-788.

Craswell, A. T., Francis, J. R., & Taylor, S. L. (1995), "Auditor brand name reputations and industry specializations", *Journal of Accounting & Economics*, Vol. 20 No. 3, pp. 297-322.

DeAngelo, L. E. (1981), "Auditor size and audit quality", *Journal of Accounting & Economics*, Vol. 3 No. 3, pp. 183.

Dechow, P. M., & Dichev, I. D. (2002), "The quality of accruals and earnings: The role of accrual estimation errors", *Accounting Review*, Vol. 77 No. Supplement, pp. 35-59.

DeFond, M. L., Raghunandan, K., & Subramanyam, K. R. (2002), "Do non-audit service fees impair auditor independence? Evidence from going concern audit opinions", *Journal of Accounting Research*, Vol. 40 No. 4, pp. 1247-1274.

Diggle, P. J., Liang, K.-Y., & Zeger, S. L. (1994). Analysis of longitudinal data. New York: Oxford University Press.

Fama, E. F., & French, K. R. (1993), "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics*, Vol. 33 No. 1, pp. 3-56.

Francis, J. R., & Ke, B. (2006), "Disclosure of fees paid to auditors and the market valuation of earnings surprises", *Review of Accounting Studies*, Vol. 11 No. 4, pp. 495-523.

Francis, J., and M. Yu. (2009), “The effect of big four office size on audit quality”, *The Accounting Review* Vol. 84, No. 5, pp. 1521-1552.

Frankel, R. M., Johnson, M. F., & Nelson, K. K. (2002), "The relation between auditors' fees for nonaudit services and earnings management", *Accounting Review*, Vol. 77 No. 4, pp. 71.

Ghosh, A., Kallapur, S., and Moon D. (2009), "Audit and non-audit fees and capital markets perceptions of auditor independence", *Journal of Accounting and Public Policy* Vol. 28 No. 5, pp. 369-385.

Koehn, J. L., and Del Vecchio, S. C. (2004), "Ripple effects of the Sarbanes-Oxley Act" *The CPA Journal*. Vol. 74 No. 2, pp. 36-40.

Kormendi, R., & Lipe, R. (1987) "Earnings innovations, earnings persistence and stock returns", *Journal of Business*, Vol. 60, No. 3, pp. 323-345.

Krishnan, J., Sami, H., & Zhang, Y. (2005), "Does the provision of nonaudit services affect investor perceptions of auditor independence?", *Auditing*, Vol. 24 No. 2, pp. 111-135.

Lim, C.-Y., & Tan, H.-T. (2008), "Non-audit service fees and audit quality: The impact of auditor specialization", *Journal of Accounting Research*, Vol. 46 No. 1, pp. 199-246.

Lobo, G. J., Zhang, W., & Zhou, J. (2006). The impace of corporate governance on discretionary accrual changes around the sarbanes-oxley act. University of Houston.

Lobo, G. J., & Zhou, J. (2006), "Did conservatism in financial reporting increase after the sarbanes-oxley act? Initial evidence", *Accounting Horizons*, Vol. 20 No. 1, pp. 57-73.

McConnell, D. K, Jr., and Banks, G. Y. (2003), "How Sarbanes-Oxley will change the audit process" *Journal of Accountancy* Vol. 196 No. 3, pp. 49-55.

Palmrose, Z.-V. (1986), "Audit fees and auditor size: Further evidence", *Journal of Accounting Research*, Vol. 24 No. 1, pp. 97-110.

Petersen, M. A. (2009), "Estimating standard errors in finance panel data sets: Comparing approaches", *Review of Financial Studies,* Vol. 22 No. 1, pp. 435-480.

Revsine, L., Collins, D. W., & Johnson, W. B. (1999), *Financial Reporting and Analysis*, Prentice Hall, Upper Saddle River, NJ.

Reynolds, J. K., & Francis, J. R. (2001), "Does size matter? The influence of large clients on office-level auditor reporting decisions", *Journal of Accounting & Economics*, Vol. 30 No. 3, pp. 375-400.

Richardson, S. A. (2003), "Earnings quality and short sellers", *Accounting Horizons*, Vol. 17, Supplement, pp. 49-61.

Richardson, S. A., Sloan, R. G., Soliman, M. T., & Tuna, I. (2005), "Accrual reliability, earnings persistence and stock prices", *Journal of Accounting & Economic*s, Vol. 39 No. 3, pp. 437-485.

Romano, R. (2005), "The sarbanes oxley act and the making of quack corporate governance", *Yale Law Journal*, Vol. 114 No. 7, pp. 1521-1612.

Schipper, K. & Vincent, L. (2003), "Earnings quality", *Accounting Horizons*, Vol. 17, Supplement, pp. 97-110.

Simunic, D. A. (1980), "The pricing of audit services: Theory and evidence", *Journal of Accounting Research*, Vol. 18 No. 1, pp. 161-190.

Simunic, D. A. (1984), "Auditing, consulting, and auditor independence", *Journal of Accounting Research*, Vol. 22 No. 2, pp. 679-702.

Sloan, R. G. (1996), "Do stock prices fully reflect information in accruals and cash flows about future earnings?", *Accounting Review*, Vol. 71 No. 3, pp. 289-315.

Table I
Descriptive Statistics

Panel A: Distributional Statistics

Variable	Mean	Standard Deviation	1st Percentile	1st Quartile	Median	3rd Quartile	99th Percentile
$Earnings_{t+1}$	-0.018	0.222	-0.894	-0.027	0.035	0.079	0.280
$TACC_t$	0.040	0.182	-0.491	-0.026	0.031	0.102	0.641
CF_t	-0.051	0.238	-1.008	-0.074	-0.000	0.044	0.339
$INFLUENCE_{t-1}$	0.053	0.126	0.001	0.005	0.013	0.039	0.705
IND_{t-1}	0.793	0.405	0	1	1	1	1
$SPEC_{t-1}$	0.272	0.445	0	0	0	1	1
BM_t	0.570	9.776	0.015	0.268	0.482	0.806	3.141
$LOSS_t$	0.300	0.458	0	0	0	1	1
$CFVOL_t$	0.084	0.258	0.006	0.027	0.049	0.090	0.578
$SVOL_t$	0.190	0.278	0.008	0.065	0.121	0.226	1.102
$OPCYCLE_t$	155.720	2,924.109	0.000	59.711	99.167	152.136	481.792
$SIZE_t$	31.187	39.732	2.706	9.411	18.045	35.900	193.259

Panel B: Distributional Statistics Pre- and Post-Sarbanes-Oxley

Variable	**Pre-SOX Mean (1998 – 2001)**	**Post-SOX Mean (2003 – 2006)**	**Difference**	***t*-statistic**
$Earnings_{t+1}$	-0.031	0.001	0.032	4.56
TACC	0.036	0.045	0.009	1.44
CF	-0.053	-0.048	0.005	0.74
IND	0.748	0.855	0.107	11.29
SPEC	0.295	0.241	-0.054	-5.39
BM	0.752	0.317	-0.435	-11.17
LOSS	0.321	0.272	-0.049	-4.90
CFVOL	0.094	0.071	-0.023	-3.23
SVOL	0.214	0.157	-0.058	-7.34
OPCYCLE	176.675	126.676	-49.999	-67.78
SIZE	26.908	37.117	10.210	109.50

Notes for Table I

AVASSET	= Average total assets (item 6) over year t.
Earnings	= Income before extraordinary items (item 18), scaled by *AVASSET*.
TACC	= Total accruals, scaled by *AVASSET*. Total accruals are equal to the change in total assets (item 6), minus the change in cash and short-term investments (item 1), plus the change in short-term investments (item 193), minus the changes in total liabilities (item 181) and preferred stock (item 130).
CF	= Cash flows; *Earnings – TACC*
INFLUENCE	= The ratio of the audit fees earned from this client over the total audit fees earned in the audit-firm office.
IND	= Audit firm independence dummy; equal to zero when *INFLUENCE* is in the top quartile, and equal to one otherwise.
SPEC	= Audit firm industry specialization dummy; when the audit firm's share of the company-year's two-digit SIC industry is greater than 1/6*1.2 (20%) for 1997, 1/5*1.2 (25%) for 1998-2000, or 1/4*1.2 (30%) for 2003-2006 *SPEC* is coded one, zero otherwise.
BM	= Book-to-market ratio
LOSS	= Dummy variable coded one if *Earnings* is less than zero, coded zero otherwise.
CFVOL	= Cash flow volatility; the standard deviation of cash flows, scaled by total assets measured over 4 years.
SVOL	= Sales volatility; the standard deviation of sales, scaled by total assets measured over 4 years.
OPCYCLE	= Operating cycle in days; $\left[\frac{(AR_t+AR_{t-1})/2}{Sales/360}\right]+\left[\frac{(Inv_t+Inv_{t-1})/2}{COGS/360}\right]$
AR	= Accounts receivable (item 151)
Inv	= Inventory (item 3)
Sales	= Sales (item 12)
COGS	= Cost of goods sold (item 41)
SIZE	= Square root of total assets.

Table II
Correlations

	Earnings	***CF***	***TACC***	***IND***	***SPEC***	***BM***	***LOSS***	***CFVOL***	***SVOL***	***OPCYCLE***	***SIZE***
Earnings		0.502	0.132	-0.093	0.033	-0.095	-0.483	-0.198	-0.058	-0.024	0.173
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CF	0.354		-0.530	-0.103	0.048	0.010	-0.386	-0.187	-0.066	-0.010	0.155
	(0.00)		(0.00)	(0.00)	(0.00)	(0.16)	(0.00)	(0.00)	(0.00)	(0.08)	(0.00)
TACC	0.231	-0.527		0.025	-0.007	0.016	-0.251	-0.002	0.030	-0.008	0.008
	(0.00)	(0.00)		(0.00)	(0.31)	(0.03)	(0.00)	(0.76)	(0.00)	(0.28)	(0.25)
IND	-0.052	-0.091	0.027		-0.050	-0.006	0.099	0.059	0.045	0.008	-0.280
	(0.00)	(0.00)	(0.00)		(0.00)	(0.40)	(0.00)	(0.00)	(0.00)	(0.28)	(0.00)
SPEC	0.010	0.040	-0.013	-0.050		0.005	-0.058	-0.040	-0.044	-0.008	0.169
	(0.15)	(0.00)	(0.07)	(0.00)		(0.25)	(0.00)	(0.00)	(0.00)	(0.30)	(0.00)
BM	-0.229	0.063	-0.179	-0.060	0.062		-0.007	-0.001	0.003	-0.003	-0.008
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.37)	(0.88)	(0.69)	(0.97)	(0.27)
LOSS	-0.056	-0.355	-0.325	0.099	-0.058	0.007		0.137	0.065	0.022	-0.208
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.33)		(0.00)	(0.00)	(0.00)	(0.00)
CFVOL	-0.244	-0.254	-0.004	0.173	-0.123	-0.157	0.341		0.148	0.003	-0.111
	(0.00)	(0.00)	(0.61)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.68)	(0.00)
SVOL	-0.052	-0.103	0.054	0.067	-0.070	-0.012	0.095	0.401		0.008	-0.130
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.09)	(0.00)	(0.00)		(0.30)	(0.00)
OPCYCLE	0.000	0.012	-0.035	0.048	-0.042	0.044	0.023	0.069	-0.017		-0.011
	(0.99)	(0.11)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)		(0.14)
SIZE	0.266	0.232	0.050	-0.295	0.162	-0.023	-0.339	-0.540	-0.280	-0.110	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

Notes for Table II

Pearson Correlations are reported above the diagonal and Spearman Correlations below the diagonal. Correlation p-values reported in parentheses.

AVASSET	=	Average total assets (item 6) over year t.
Earnings	=	Income before extraordinary items (item 18), scaled by *AVASSET*.
TACC	=	Total accruals, scaled by *AVASSET*. Total accruals are equal to the change in total assets (item 6), minus the change in cash and short-term investments (item 1), plus the change in short-term investments (item 193), minus the changes in total liabilities (item 181) and preferred stock (item 130).
CF	=	Cash flows; *Earnings – TACC*
INFLUENCE	=	The ratio of the audit fees earned from this client over the total audit fees earned in the audit-firm office.
IND	=	Audit firm independence dummy; equal to zero when *INFLUENCE* is in the top quartile, and equal to one otherwise.
SPEC	=	Audit firm industry specialization dummy; when the audit firm's share of the company-year's two-digit SIC industry is greater than 1/6*1.2 (20%) for 1989-1997, 1/5*1.2 (25%) for 1998-2001, or 1/4*1.2 (30%) for 2002-2005 *SPEC* is coded one, zero otherwise.
BM	=	Book-to-market ratio
LOSS	=	Dummy variable coded one if *Earnings* is less than zero, coded zero otherwise.
CFVOL	=	Cash flow volatility; the standard deviation of cash flows, scaled by total assets measured over 4 years.
SVOL	=	Sales volatility; the standard deviation of sales, scaled by total assets measured over 4 years.
OPCYCLE	=	Operating cycle in days; $\left[\frac{(AR_t+AR_{t-1})/2}{Sales/360}\right]+\left[\frac{(Inv_t+Inv_{t-1})/2}{COGS/360}\right]$
AR	=	Accounts receivable (item 151)
Inv	=	Inventory (item 3)
Sales	=	Sales (item 12)
COGS	=	Cost of goods sold (item 41)
SIZE	=	Square root of total assets.

Table III

Regressions of one-year-ahead earnings on current cash flow and accruals, with separate coefficients for pre- and post-SOX periods

$$Earnings_{t+1} = \alpha_0 + D_{pre}\left(\alpha_1^{pre} CF_t + \alpha_2^{pre} TACC_t\right) + D_{post}\left(\alpha_1^{post} CF_t + \alpha_2^{post} TACC_t\right) + \sum_{k=2}^{7} \alpha_{k+1}\left(Control_k \times TACC_t\right) + \varepsilon \quad (2)$$

Variable	Estimated Coefficients	t-statistics	Estimated Coefficients	t-statistics
Intercept	-0.006	-4.87	-0.006	-5.03
Pre-Sox:				
CF	0.757	34.33	0.759	34.24
TACC	0.626	26.71	0.841	14.04
Post-Sox:				
CF	0.817	33.39	0.817	33.51
TACC	0.753	30.76	0.955	16.50
Controls				
*BM*TACC*			-0.089	-1.65
*LOSS*TACC*			-0.005	-0.18
*CFVOL*TACC*			-0.100	-2.21
*SVOL*TACC*			-0.102	-1.89
*OPCYCLE*TACC*			-0.093	-2.22
*SIZE*TACC*			-0.087	-1.79
Adjusted R2	0.47		0.48	
Hypothesis test:				
***H1*: $\alpha_2^{post} > \alpha_2^{pre}$**	**0.127**	**3.78*** **	**0.114**	**3.44*** **

Notes for Table III

Huber-White *t*-statistics calculated as described in Diggle et al. (1994)

***	Significant at greater than 0.01; one-tail test
**	Significant at greater than 0.05; one tail test

AVASSET	= Average total assets (item 6) over year t.
Earnings	= Income before extraordinary items (item 18), scaled by *AVASSET*.
TACC	= Total accruals, scaled by *AVASSET*. Total accruals are equal to the change in total assets (item 6), minus the change in cash and short-term investments (item 1), plus the change in short-term investments (item 193), minus the changes in total liabilities (item 181) and preferred stock (item 130).
CF	= Cash flows; *Earnings – TACC*
D_{pre}	= Dummy variable coded one if year equals 1997 through 2000; zero otherwise.
D_{post}	= Dummy variable coded one if year equals 2003 through 2006; zero otherwise.
BM	= Book-to-market ratio
LOSS	= Dummy variable coded one if *Earnings* is less than zero, coded zero otherwise.
CFVOL	= Cash flow volatility; the standard deviation of cash flows, scaled by total assets measured over 4 years.
SVOL	= Sales volatility; the standard deviation of sales, scaled by total assets measured over 4 years.
OPCYCLE	= Operating cycle in days; $\left[\frac{(AR_t+AR_{t-1})/2}{Sales/360}\right]+\left[\frac{(Inv_t+Inv_{t-1})/2}{COGS/360}\right]$
AR	= Accounts receivable (item 151)
Inv	= Inventory (item 3)
Sales	= Sales (item 12)
COGS	= Cost of goods sold (item 41)
SIZE	= Square root of total assets.

Table IV
Variable means partitioned by IND

Variable	IND = 0	IND = 1	Difference	*t*-statistic
$Earnings_{t+1}$	0.023	-0.028	-0.051	-6.04
TACC	0.031	0.042	0.011	1.44
CF	-0.005	-0.063	-0.058	-6.74
SPEC	0.316	0.261	-0.054	-4.50
BM	0.689	0.539	-0.150	-2.78
LOSS	0.212	0.324	0.112	9.12
CFVOL	0.055	0.092	0.037	4.13
SVOL	0.165	0.196	0.03123	3.24
OPCYCLE	109.879	167.705	57.825	62.14
SIZE	52.963	25.493	-27.470	-248.59

AVASSET = Average total assets (item 6) over year t.
Earnings = Income before extraordinary items (item 18), scaled by *AVASSET*.
TACC = Total accruals, scaled by *AVASSET*. Total accruals are equal to the change in total assets (item 6), minus the change in cash and short-term investments (item 1), plus the change in short-term investments (item 193), minus the changes in total liabilities (item 181) and preferred stock (item 130).
CF = Cash flows; *Earnings – TACC*
INFLUENCE = The ratio of the audit fees earned from this client over the total audit fees earned in the audit-firm office.
IND = Audit firm independence dummy; equal to zero when *INFLUENCE* is in the top quartile, and equal to one otherwise.

SPEC = When the audit firm's share of the company-year's two-digit SIC industry is greater than 1/6*1.2 (20%) for 1989-1997, 1/5*1.2 (25%) for 1998-2001, or 1/4*1.2 (30%) for 2002-2005 *SPEC* is coded one, zero otherwise.
BM = Book-to-market ratio
LOSS = Dummy variable coded one if *Earnings* is less than zero, coded zero otherwise.
CFVOL = Cash flow volatility; the standard deviation of cash flows, scaled by total assets measured over 4 years.
SVOL = Sales volatility; the standard deviation of sales, scaled by total assets measured over 4 years.
OPCYCLE = Operating cycle in days; $\left[\frac{(AR_t+AR_{t-1})/2}{Sales/360}\right]+\left[\frac{(Inv_t+Inv_{t-1})/2}{COGS/360}\right]$
AR = Accounts receivable (item 151)
Inv = Inventory (item 3)
Sales = Sales (item 12)
COGS = Cost of goods sold (item 41)
SIZE = Square root of total assets.

Table V
Regressions of one-year-ahead earnings on current cash flow and accruals, with separate coefficients for pre- and post-SOX periods and IND

$$Earnings_{t+1} = \gamma_0 + D_{pre}\left(\gamma_1^{pre} CF_t + \gamma_2^{pre} TACC_t + \gamma_3^{pre} IND_{t-1} \times TACC_t\right) + D_{post}\left(\gamma_1^{post} CF_t + \gamma_2^{post} TACC_t + \gamma_3^{post} IND_{t-1} \times TACC_t\right) + \sum_{k=1}^{7} \gamma_{k+3}\left(Control_k \times TACC_t\right) + \varepsilon \quad (3)$$

Variable (hypothesis test)	Estimated Coefficients	t-statistics
Intercept	-0.006	-5.06
Pre-Sox:		
CF	0.759	34.22
TACC	0.845	13.95
*IND*TACC*	0.000	0.00
Post-Sox:		
CF	0.817	33.47
TACC	1.057	17.24
*IND*TACC*	-0.105	-3.17
Controls		
*SPEC*TACC*	-0.030	-0.81
*BM*TACC*	-0.086	-1.57
*LOSS*TACC*	-0.006	-0.21
*CFVOL*TACC*	-0.097	-2.13
*SVOL*TACC*	-0.102	-1.90
*OPCYCLE*TACC*	-0.093	-2.23
*SIZE*TACC*	-0.086	-1.69
Adjusted R2	0.48	
Hypothesis Tests:		
***H1*:**		
Low-IND: $\gamma_2^{post} > \gamma_2^{pre}$	**0.212**	**5.20*****
High-IND: $\left(\gamma_2^{post} + \gamma_3^{post}\right) > \left(\gamma_2^{pre} + \gamma_3^{pre}\right)$	**0.107**	**3.09*****
***H2*:** $\gamma_2^{post} - \gamma_2^{pre} > \left(\gamma_2^{post} + \gamma_3^{post}\right) - \left(\gamma_2^{pre} + \gamma_3^{pre}\right)$	**0.105**	**2.43****

Notes for Table III

Huber-White *t*-statistics calculated as described in Diggle et al. (1994)

***	Significant at greater than 0.01; one-tail test
**	Significant at greater than 0.05; one tail test

AVASSET	=	Average total assets (item 6) over year t.
Earnings	=	Income before extraordinary items (item 18), scaled by *AVASSET*.
TACC	=	Total accruals, scaled by *AVASSET*. Total accruals are equal to the change in total assets (item 6), minus the change in cash and short-term investments (item 1), plus the change in short-term investments (item 193), minus the changes in total liabilities (item 181) and preferred stock (item 130).
CF	=	Cash flows; *Earnings – TACC*
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D_{post}	=	Dummy variable coded one if year equals 2003 through 2006; zero otherwise.
INFLUENCE	=	The ratio of the audit fees earned from this client over the total audit fees earned in the audit-firm office.
IND	=	Audit firm independence dummy; equal to zero when *INFLUENCE* is in the top quartile, and equal to one otherwise.
SPEC	=	When the audit firm's share of the company-year's two-digit SIC industry is greater than 1/6*1.2 (20%) for 1989-1997, 1/5*1.2 (25%) for 1998-2001, or 1/4*1.2 (30%) for 2002-2005 *SPEC* is coded one, zero otherwise.
BM	=	Book-to-market ratio
LOSS	=	Dummy variable coded one if *Earnings* is less than zero, coded zero otherwise.
CFVOL	=	Cash flow volatility; the standard deviation of cash flows, scaled by total assets measured over 4 years.
SVOL	=	Sales volatility; the standard deviation of sales, scaled by total assets measured over 4 years.
OPCYCLE	=	Operating cycle in days; $\left[\frac{(AR_t+AR_{t-1})/2}{Sales/360}\right]+\left[\frac{(Inv_t+Inv_{t-1})/2}{COGS/360}\right]$
AR	=	Accounts receivable (item 151)
Inv	=	Inventory (item 3)
Sales	=	Sales (item 12)
COGS	=	Cost of goods sold (item 41)
SIZE	=	Square root of total assets.