



The Sarbanes-Oxley Act of 2002 and Market Liquidity

Pankaj K. Jain

The University of Memphis

Jang-Chul Kim*

Northern Kentucky University

Zabihollah Rezaee

The University of Memphis

Abstract

Investors rely heavily on the trustworthiness and accuracy of corporate information to provide liquidity to the capital markets. We find that the rash of financial scandals caused a severe deterioration in market liquidity in the form of wider spreads, lower depths, and a higher adverse selection component of spreads vis-à-vis their benchmark levels. Regulatory responses including the Sarbanes-Oxley Act of 2002 (SOX) had inconsequential short-term liquidity effects but highly significant and positive long-term liquidity effects. These liquidity improvements are positively associated with the improved quality of financial reports, several firm-specific variables (e.g., size), and market factors (e.g., price, volatility, volume).

Keywords: Sarbanes-Oxley Act, SOX, sarbox, stock market liquidity, corporate governance, financial reporting, accounting fraud

JEL Classifications: G14, M41

*Corresponding author: Department of Economics and Finance, College of Business, Northern Kentucky University, Highland Heights, KY 41099; Phone: (859) 572-6581; Fax: (859) 572-6627; E-mail: jangchulkim@gmail.com

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1. Introduction

The efficient functioning of capital markets depends on the quality, reliability and transparency of financial information disseminated to the markets. Heflin, Shaw and Wild (2002) find that high-quality disclosures improve market liquidity by reducing information asymmetries. Congress passed the Sarbanes-Oxley Act of 2002 (hereafter, SOX) in response to the financial scandals at the turn of the 21st century that eroded investor confidence in public financial information. Anecdotal evidence (Donaldson, 2005) and empirical studies (Jain and Rezaee, 2006; Li, Pincus and Rego, 2008) suggest that SOX is a significant contributor to restoring investor confidence. The Committee on Capital Markets Regulation, an independent group of U.S. business leaders, however, raises concerns about the effects of SOX on the global competitiveness of U.S. capital markets and calls for the relaxation of some of its rules (Committee on Capital Markets Regulation, 2006). In this paper we investigate the possible effects of financial scandals, Congressional responses (SOX legislation), and related Securities and Exchange Commission (SEC) regulations (SOX implementation rules) on market liquidity.

This study contributes to the literature in accounting and finance in several ways. First, it expands a broader stream of research (e.g., La Porta, Lopez-De-Silanes, Shleifer and Vishny, 1998, 2002) pertaining to the relation between the legal protection of investors and the development of financial markets by showing whether market liquidity responds to perceived shifts in investor protection. Second, this paper complements recent research examining the economic consequences of regulations (e.g., Bushee and Leuz, 2005).

Our study differs from prior research in at least three important respects. First, unlike prior studies (Anderson and Yohn, 2003; Chiyachantana, Jiang, Taechapiroontong and Wood, 2004; Eleswarapu, Thompson and Venkataraman, 2004; Findlay and Mathew, 2006), we focus on SOX reforms intended to change corporate governance characteristics and financial attributes of public companies and their relations with changes in market liquidity measures. This allows us to investigate the effects of financial scandals and subsequent regulatory responses on measures of market liquidity. We do so by examining changes in market liquidity measures caused by financial scandals and regulations designed to prevent such scandals (SOX).

Second, we investigate the market liquidity effects of accounting irregularities and regulations drafted in response to them. The regulations intended to improve are not only the reliability of financial reports but also the professional accountability and personal integrity of those who participate in the financial reporting process (e.g., corporate directors, executives, auditors, financial analysts and investment banks). This makes our study much broader than Regulation FD studies that analyze the effect on liquidity of creating a level playing field among large and small investors. Finally, our study is a two-step analysis that first examines the effect of regulation on information asymmetry and then links liquidity changes to the changes in information asymmetry. This approach of looking at multiple facets of SOX effects and finding consistency

among measures increases our confidence that SOX effects are real and not spurious. We relate changes in market liquidity directly to the intended improvements in corporate governance and financial reporting and craft more robust tests of the impact of regulations on market liquidity.

We examine the level of and changes in market liquidity along a timeline that contains four distinct test periods, namely a benchmark, financial scandals, SOX legislation, and SEC regulations implementing SOX provisions. Our key liquidity measures are quoted spreads, effective spreads, depths and adverse selection components of spreads. Our univariate analysis shows that scandals adversely affect liquidity measures. We obtain changes in liquidity measures by subtracting benchmark levels from the scandal window levels. We present the changes due to legislation and regulation by subtracting the scandal window levels from the legislation period window liquidity and regulation window liquidity. These measures show that market liquidity improves, particularly in the long run, after the passage of SOX, consistent with SOX efficacy.

These findings suggest that SOX and the SEC implementation rules are successful in improving market liquidity and restoring investor confidence in the financial markets. The observed liquidity improvements are positively associated with improvements in the quality of financial reports in the post-SOX period. Regression results indicate that the changes in market liquidity measures in the SOX legislation and regulation periods are pervasive and particularly acute for large firms with high stock price volatility and volume. Our results are robust even after controlling for several firm-specific variables (size), market factors (stock price, volume, volatility), and microstructure events (NYSE OpenBook).

2. Background on the Sarbanes-Oxley Act

The Public Company Accounting Reform and Investor Protection Act of 2002, better known as the Sarbanes-Oxley Act of 2002 (SOX), was signed into law on July 30, 2002. SOX was enacted in response to an increasing number of financial restatements by prominent companies, high profile cases of financial scandals, erosion in investor confidence and extreme market volatility. SOX imposes substantial new requirements on parties who produce, certify, audit and analyze public financial information. Provisions of SOX and SEC-related implementation rules are continuous reforms, rather than a one-shot event, that affect public companies, corporate governance, financial reporting and audit functions. Provisions of SOX are implemented through rules and enforcement procedures of the SEC.

Descriptive research (Rezaee, 2002, 2004; Osterland, 2002; Cunningham, 2003; Coates, 2007) suggests that the effects of SOX include: (1) improved corporate governance, in part due to reduced information asymmetry between management and shareholders; (2) enhanced quality, reliability and transparency of financial information, which reduces information risk that financial statements are inaccurate, incomplete, false, or misleading; and (3) improved audit effectiveness and credibility through

a prohibition on the same firm providing nonaudit services contemporaneously with audit services, and through the creation of the Public Company Accounting Oversight Board (PCAOB) to regulate the auditing profession. SOX authorizes the SEC to issue rules to implement its provisions through multiple detailed rulemaking assignments. SEC regulatory implementation of the rules started within 90 days of legislation and picked up steam in 2003. By the end of 2003, more than a year after the passage of SOX, the SEC issued implementation rules for almost all provisions of SOX pertaining to corporate governance, financial reporting and audit activities of public companies.

In describing the long-term benefits of compliance with the provisions of SOX, the then chairman of the SEC, William A. Donaldson (Donaldson, 2005), states:

... the Sarbanes-Oxley reforms should yield extraordinary long-term benefits in the form of improved financial reporting, better management control, and more ethical behavior by companies and gatekeepers. This, in turn, should lead to sounder corporate governance, better and more reliable reporting, improved corporate performance, enhanced investor confidence and, ultimately, a lower cost of capital.

Crutchley, Jensen and Marshall (2007) report that fewer outside directors on the audit committees is associated with an increased probability of financial fraud. The authors remark that SOX provisions intended to “increase outside board representation, particularly on the audit committee, seem well founded” (p. 68).

The long-term effects of compliance with SOX and SEC-related rules driven by improvement in the quality of financial information can be associated with changes in market liquidity measures. Almost five years after the passage of SOX, its efficacy has been challenged on the grounds that its implementation rules should be much more cost-justified, efficient and scalable without undermining the intent of improving the reliability of financial reports, investor confidence and market liquidity (Committee on Capital Markets Regulation, 2006). In summary, SOX, by assisting public companies to identify and manage conflicts of interest between the board of directors, executives and auditors of public companies, is expected to improve the quality of financial reports. As investors receive more reliable and transparent financial information, they have less incentive to obtain private information, which decreases information asymmetry in the market.

3. Literature review

Information asymmetry between managers and shareholders can adversely affect the valuation of a firm's stock (Myers and Majluf, 1984). Informed traders thrive in a less transparent environment and profit more from their private information, thus creating an adverse selection problem for investors. Kyle (1985) and Glosten and Milgrom (1985) show that, in the presence of information asymmetry, market makers earn the bid-ask spread from uninformed noise traders (who trade for liquidity reasons) and lose the difference between the full information value of the stock and the trade price given to informed traders (who trade on the basis of private information).

Lee, Mucklow and Ready (1993) find that spreads widen and depths drop in anticipation of quarterly earnings announcements, even during and after earnings releases, which suggests that specialists and other liquidity providers manage information asymmetry risk by adjusting both depths and spreads. Bushee and Leuz (2005) show that regulatory changes that increase mandated disclosures induce significant costs for noncompliant firms, whereas compliant firms experience positive stock returns and improvements in market liquidity, indicating positive externalities for disclosure regulation. Eleswarapu, Thompson and Venkataraman (2004), Chiyachantana, Jiang, Taechapiroontong and Wood (2004), and Findlay and Mathew (2006) find that Regulation Fair Disclosure improves market liquidity by reducing the adverse selection component of trading costs and thus reducing information asymmetry. Anderson and Yohn (2003) find that security returns and bid-ask spreads are negatively affected by accounting problem announcements that lead to financial restatements (e.g., revenue recognition problems).

The theoretical models and the related empirical findings discussed above suggest that the quality of accounting information is an important variable in financial markets. Such relations motivate us to analyze the effects of SOX.

4. Research questions and related hypotheses

We begin our inquiry by addressing whether reported scandals and responding legislation and regulation significantly affect market liquidity. Liquidity could remain unchanged if SOX were ineffective in achieving its goals of restoring investor confidence; it could deteriorate if the provisions of SOX and its compliance costs negatively affect the value of or costs of investing in equities; or it could improve if SOX effectively solves the problems highlighted by the high profile scandals.

Both anecdotal evidence and popular press reports suggest that high profile financial scandals made market participants wary of the possibility of increased adverse selection costs in all equities, big and small. When the public information provided by larger companies becomes questionable, market participants face a heightened risk of incurring trading losses against a privately informed insider. Kyle (1985) suggests that the suppliers of liquidity (the market makers) recover the adverse selection costs through higher bid-ask spreads. Thus, the investigation of spreads and depths can be useful in determining the effects of the scandals and the relevance and efficacy of SOX.

The period from October 2001 to June 2002 was characterized by substantial financial restatements by prominent companies, pervasive financial scandals at high profile companies and revelations of audit failures. The post-SOX period is characterized by significant corporate governance reforms (e.g., SOX, SEC rules, listing standards, and best practices). Three years after the passage of SOX, Sarbanes (2006) states:

Now the law [SOX] is working as intended. . . Auditor independence has been restored. . . The Public Company Accounting Oversight Board provides the necessary rigorous

regulatory framework for the accounting industry, replacing self-regulation, which had demonstrably failed. The SEC has the resources to hire additional staff and improve its technology infrastructure. Corporate governance best practices are changing for the better. . . Investors have regained confidence in our capital markets.

The post-SOX era has also witnessed significant improvements beyond compliance with provisions of SOX and SEC-related rules in board independence, audit committee oversight effectiveness, audit efficacy, shareholder monitoring and internal controls. If the scandals make market makers more concerned about the adverse selection problem, then we should observe deterioration in market liquidity measures in terms of wider bid-ask spreads. Subsequently, if SOX is successful in boosting investor confidence, we should observe improvements in market liquidity as bid-ask spreads decrease toward their normal levels. In contrast, if compliance costs of SOX exceed its benefits and if its requirements cause delays or disruption in the transparent flow of information, then liquidity might actually worsen. This leads to the hypothesis:

Null hypothesis 1: *Stock market liquidity is unrelated to financial scandals or Sarbanes-Oxley Act legislation and implementation.*

Next, we address the question motivated by the evidence in Cohen, Dey and Lys (2004) of whether earnings management (deterioration in the quality of financial reporting) increases during the scandal period and decreases in the post-SOX period. We investigate whether there is a relation between the expected improvements in the quality of financial reports and improvements in market liquidity measures. Finally, we investigate whether improvements in post-SOX market liquidity measures are of equal magnitude across firms after controlling for several firm-specific variables. Thus, the related hypothesis is:

Null hypothesis 2: *Changes in market liquidity measures have no relation to the improved quality of financial reports, firm characteristics, or market events.*

5. Research design

5.1. Timeline of events

We search the “Corporate Scandal Sheet” developed by *Forbes* to identify the scandal period when the major financial scandals of Enron, WorldCom, Global Crossing, Qwest, Adelphia, Tyco and others are publicized (Forbes, 2002). We also obtain a timeline of events associated with the passage of SOX from the Library of Congress web site, <http://thomas.loc.gov/>, and cross-check the dates with the *Wall Street Journal index*, the *Wall Street Journal*, the *New York Times* and Dow Jones News Retrieval. The effective date of SEC implementation rules comes from the SEC web site (<http://www.sec.gov/>).

We begin our overall sample period in May 2001. The main motivation for this choice is the SEC rule change on minimum tick size from one-sixteenth of a dollar to

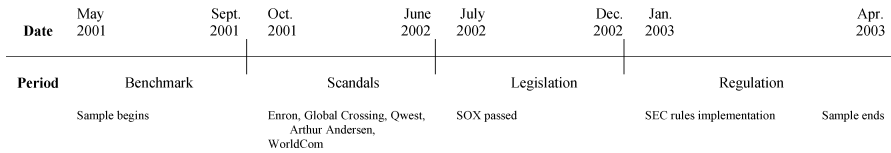


Figure 1

Timeline of events pertaining to reported financial scandals and the Sarbanes-Oxley Act

one cent. The NYSE implemented decimal pricing of stocks in January 2001, Nasdaq in April 2001. Bacidore, Battalio and Jennings (2003) and Chakravarty, Wood and Van Ness (2004) report that decimal prices significantly affect market liquidity measures. We designate May through September 2001 as the benchmark period. The scandal period in Figure 1 starts with the revelation of the Enron scandal in October 2001. A series of scandals of well-known companies, such as Global Crossing, Qwest, Imclone, Tyco and Adelphia, followed. The wave of scandals culminated with the WorldCom fiasco in June 2002.

The third period on the timeline is the legislation period from June 2002 through December 2002. The law was passed on July 30, 2002 and we allow for six months for the effects of law to be felt in information dissemination and trading practices. SOX directed the SEC to establish rules to implement many of its provisions within 30, 90, 180 and 270 days after its passage.¹ We designate January 2003 through April 2003 as the regulatory period.

5.2. Sample selection

SEC order 4–440 requires that 947 large public companies with reported revenues of greater than \$1.2 billion have their financial statements certified by their senior executives. We focus on these firms because they have the earliest certification requirements. By August 14, 2002, 745 public companies had to certify their financial statements, and 681 actually submitted executive certifications on time. Of these, the 610 firms in the final sample are those that have data available from Compustat (for financial variables, e.g., earnings, cash flows, total assets) and TAQ (trades and quotes); 532 firms are listed on the NYSE, 73 on Nasdaq and five on Amex. The results reported in this paper are qualitatively unchanged when we repeat the analysis on NYSE firms alone.

We extract bid-ask quotes, depths, transaction prices, and volumes for the stocks of these companies for every transaction for our test dates as illustrated in Figure 1. We

¹ Some provisions of SOX became effective immediately on its passage (e.g., enhanced criminal penalties for securities fraud, no personal loans to corporate insiders). Other provisions became effective shortly after the passage of SOX (e.g., executive certification of financial statements). Nonetheless, important provisions of SOX that are expected to have liquidity effects either became effective in 2003 or were applied to the end of the 2002 financial statements (e.g., executive certifications of financial reports and internal controls, audit opinion on internal controls).

apply data filters, including the ones in Huang and Stoll (1996), to remove outliers.² This filtering process causes a loss of 0.86% of the observations, resulting in a final sample of 71,755,401 observations for 610 firms. We first calculate the daily average of liquidity measures separately for each. For the univariate comparison, we compute the average of each liquidity measure across firms for the test periods in Figure 1.

Table 1 presents descriptive statistics for the 610 sample firms from 2001 to 2003. Their average stock price is \$33 and trading volume is roughly 40 million shares. In line with the microstructure literature, the means of liquidity variables, which we analyze later on, are 0.27% for quoted spreads, 0.19% for effective spreads. Accrual, defined formally in Equation (2) later as the difference between reported earnings and cash flows, is our instrumental variable through which SOX potentially affects the informational environment, which eventually affects market liquidity. The overall average accrual is 5.75% of total assets.

5.3. Univariate liquidity measures analysis

We begin by investigating changes in measures of market liquidity during the scandal, legislative, and regulatory periods. For every quote in the TAQ database for our samples, we obtain the percentage spread by dividing the dollar spread (the difference between ask and bid prices) by the midpoint of the bid and ask. We also calculate average dollar depths, which represent the quoted size or quantity of shares times the quoted price at which the market maker is willing to trade. The dollar depth is the number of shares bid times bid price plus number of shares offered times ask price.

To integrate the two measures, we define our liquidity index as dollar depth divided by percentage spreads. We collect the mean values of all liquidity measures for our sample for each of the four test windows. We also analyze the adverse selection component of spreads. Prior research (Diamond and Verrecchia, 1991) shows that the quality of financial disclosures affects information asymmetry in the stock market. We use the methods of Glosten and Harris (1988) and Huang and Stoll (1997) to extract the adverse selection component from the spread for each stock.³ We derive

² The filtering procedures remove: quotes where the bid price, ask price, bid size or ask size is negative or the bid-ask spread is greater than \$4 or negative; trades and quotes that change by more than 10% compared to the last tick, are posted before the open or after the close, are out of time sequence or involve an error; trades with a negative price or volume; depths that change by more than 100 times for just one record; and firms that are unlisted or are missing from the CRSP, Compustat or TAQ database. Skipping the filtering except for dropping unlisted firms and those missing from TAQ does not materially alter the overall results of the paper.

³ In the Glosten and Harris (1988) model, the adverse selection component and other components, such as the inventory-holding and order-processing components, are expressed as a linear function of transaction volume:

$$\Delta P_t = c_0 \Delta I_t + c_1 \Delta I_t V_t + z_0 I_t + z_1 I_t V_t + \varepsilon_t,$$

where I_t is a trade indicator that takes a value of +1 if the transaction is buyer-initiated and -1 if seller-initiated. P_t is the transaction price at time t , V_t is the volume traded at time t , and ε_t captures public

Table 1

Descriptive statistics of large public companies subject to early requirements of SOX

The sample consists of 610 NYSE, AMEX and Nasdaq-listed firms with reported revenues greater than \$1.2 billion that filed financial statements certified by their senior executives by August 14, 2002 and for which CRSP, Compustat and TAQ data are available. Descriptive statistics are based on the entire sample period from 2001 to 2003. Return volatility, spreads, and depths come from the TAQ database. Return volatility is the SD of daily closing quote midpoint returns. Abnormal returns are calculated from the single factor market model using the CRSP value-weighted index. Market value of equity and firm age are from the CRSP U.S. stock database and the number of analysts following is from I/B/E/S.

Variable	Percentile						
	Mean	SD	Min	25	50	75	Max
Price (\$)	33.12	21.58	2.21	18.87	30.46	43.15	249.20
Return volatility	0.0250	0.0115	0.0092	0.0173	0.0219	0.0288	0.1015
Trading volume (thousands)	39,519.32	68,293.56	138.98	6,111.03	16,428.27	42,812.73	568,132.67
Quoted spread (%)	0.27	0.31	0.06	0.13	0.18	0.28	3.02
Effective spread (%)	0.19	0.21	0.05	0.09	0.13	0.19	2.05
Depth (shares bid + shares offered)	1,949	1,279	394	1,156	1,591	2,242	8,816
Depth (\$ in thousands)	52.52	31.36	5.23	32.54	46.48	64.05	246.75
Depth (\$ in thousands)/Quoted spread (%)	441.58	470.66	2.46	150.33	303.61	574.06	4,924.71
Abnormal return (%)	-0.09	0.59	-3.93	-0.35	-0.09	0.11	5.20
Market value of equity (\$ in millions)	11,195.45	28,174.52	110.82	1,428.19	3,220.77	8,649.91	325,965.18
Firm age	31.03	22.25	3	11	31	41	78
Number of analysts following	10.64	6.65	0	6	10	15	29
TACC (accruals divided by assets)	-0.0575	0.0692	-0.6003	-0.0821	-0.0500	-0.0219	0.5953

the spread components from slope coefficients of time-series regression models by regressing transaction price changes on the trade indicator variable.

5.4. Regression analysis

During our test windows, we use regression analysis to link the changes in market liquidity measures to SOX while controlling for several significant firm-specific variables, microstructure events, and trading characteristics. We estimate the following model with daily average percentage quoted spread and percentage effective spread as dependent variables (inverse liquidity measures) in separate regressions:

$$\begin{aligned} \text{Liquidity measure} = & \beta_0 + \beta_1 \text{Scandals} + \beta_2 \text{SOX legislation} \\ & + \beta_3 \text{SEC Regulation} + \beta_4 \text{Inverse price} + \beta_5 \text{Log volume} \\ & + \beta_6 \text{Price volatility} + \beta_7 \text{Log firm size} + \varepsilon, \end{aligned} \quad (1)$$

where *Scandals*, *SOX legislation*, and *SEC regulation* are indicator variables that are equal to one for the respective nonoverlapping test periods indicated in Figure 1; *Inverse price* is the reciprocal of the average of bid price and ask price; *volume* is the dollar daily trading volume; and *firm size* is the dollar market capitalization of the stock. For direct liquidity measures, such as depths or liquidity index, we expect β_1 to be negative and β_2 and β_3 to be positive. In alternative regressions with inverse liquidity measures, such as spreads or their adverse selection components as dependent variables, we expect the opposite signs, i.e., positive β_1 and negative β_2 and β_3 .

5.5. Earnings quality

A complete investigation of the potential liquidity-improvement effects of SOX requires linking them to expected improvements in earnings quality. We compute the pre-SOX legislation and post-SOX regulation average abnormal accruals, which

information innovations and errors. In this model, the adverse selection component is $2(z_0 + z_1 V_t)$, and other components are measured as $2(c_0 + c_1 V_t)$. We use the average transaction volume for stock i to obtain an estimate of the adverse selection component as a percentage of the bid-ask spread:

$$\{2(z_0 + z_1 \bar{V})\} / \{2(c_0 + c_1 \bar{V}) + 2(z_0 + z_1 \bar{V})\} * 100.$$

Huang and Stoll's (1997) model has three-way decomposition of the spread. The following two-equation model is based on induced serial correlation in trade flows:

$$E(I_{t-1}|I_{t-2}) = (1 - 2\pi)I_{t-2} \text{ and } \Delta M_t = (\alpha + \beta)^{1/2} S_{t-1} I_{t-1} - \alpha(1 - 2\pi)^{1/2} S_{t-2} I_{t-2} + \varepsilon,$$

where I_t is a trade indicator that takes a value of +1 if the transaction is buyer-initiated and -1 if seller-initiated, and p is the probability that the trade at time t is opposite in sign to the trade at $t - 1$. M_t is the midpoint of the quote that prevails just before the transaction. S_t is the spread just prior to the transaction. α and β are the percentages of the half-spread attributable to adverse selection and inventory holding costs. Thus, the order-processing component is equal to $(1 - \alpha - \beta)$. To obtain the adverse selection component, α , the GMM procedure is used to simultaneously estimate the two-equation system.

are inverse measures of earnings quality (e.g., Dechow and Dichev, 2002). Following Hribar and Collins (2002) and Jo and Kim (2007), we calculate accruals directly from the cash flows statement:

$$TACC_{it} = [EBXI_{it} - CFO_{it}]/(TA_{it-1}), \quad (2)$$

where:

$TACC_{it}$ = normalized accrual adjustment provided on the cash flows statement for firm i for year t ;

$EBXI_{it}$ = earnings before extraordinary items and discontinued operations (Compustat #123);

CFO_{it} = operating cash flows (from continuing operations) taken directly from the statement of cash flows (Compustat #308 – Compustat #124); and

TA = total assets (Compustat #6).

Using the abnormal accruals, we analyze the effects of changes in earnings quality on liquidity in the following regression:

$$\begin{aligned} \Delta \text{Quoted spread or } \Delta \text{Effective spread} = & \beta_0 + \beta_1 \Delta (TACC) + \beta_2 \Delta (1/ \text{Price}) \\ & + \beta_3 \Delta \text{Return volatility} \\ & + \beta_4 \Delta \text{Log (Dollar trading volume)} \\ & + \beta_5 \Delta \text{Log (Market value of equity)} + \varepsilon, \end{aligned} \quad (3)$$

where:

Δ indicates the change in the value of each variable resulting from SOX obtained by subtracting the pre-SOX average from the post-SOX average for each stock;

$\text{Quoted spread}_{i,t}$ is the mean quoted percentage spread of stock i in year t ;

$\text{Effective spread}_{i,t}$ is the mean effective percentage spread of stock i in year t ;

$TACC_{i,t}$ is normalized accruals of stock i in year t ;

$\text{Price}_{i,t}$ is the mean price of stock i in year t ;

$\text{Return volatility}_{i,t}$ is the standard deviation (SD) of daily closing quote mid-point returns of stock i in year t ;

$\text{Dollar trading volume}_{i,t}$ is the mean daily dollar trading volume of stock i in year t ;

$\text{Market value of equity}_{i,t}$ is the market value of equity of stock i at the beginning of year t ;

$\varepsilon_{i,t}$ is the error term.

Spreads and TACC are both inverse measures of liquidity and earnings quality, respectively. Therefore, we expect a positive relation (β_1) between the two. In alternative regressions with direct liquidity measures, such as depths or liquidity index as dependent variables, we would expect β_1 to be negative.

6. Results

6.1. Univariate market liquidity analysis

We analyze changes in liquidity measures during the scandal and regulatory periods. Adverse selection components computations require millions of observations. To make them more manageable we choose a two-week window for our benchmark window from August 15–28, 2001 for these calculations. Similarly, for the scandal window we choose a two-week window from October 1–12, 2001 and June 17–29, 2002 surrounding the Enron and WorldCom scandals.

6.1.1. Liquidity effects of financial scandals

The third column in Table 2 calculates differences in liquidity measures by subtracting benchmark levels from the scandal window levels. The results indicate that average quoted and effective spreads increase by seven and five basis points, respectively, in the scandal window compared with the benchmark window. The increases are statistically significant at the 1% level. The adverse selection component share of spreads increases by 3.31%, or 0.38 cents in absolute terms, in the scandal window, suggesting that deterioration in the information environment is a key driver of decline in liquidity. There is no statistically significant change in dollar depth.

Table 2, Panel B shows that the liquidity measures deteriorate during the scandal period despite the increase in trading volumes. Under normal circumstances, a higher turnover would mean that market makers could earn the same profits even with a narrower spread margin. Similarly, Harris and Raviv (1993) suggest that shocks to volume could just reflect a lack of consensus corresponding to additional buy and sell limit orders inside the spread, which would tend to tighten, rather than widen, spreads. Conversely, in the model of Easley and O'Hara (1992), market makers use trading volume as a signal that an information event has occurred, and they respond by widening spreads. Lee, Mucklow and Ready (1993) find support for the latter relation, which is consistent with our finding that the adverse selection component of the total spread increases.

6.1.2. Short-term liquidity effects of SOX

We observe mixed results regarding the immediate response to legislation. In the fourth column, changes in liquidity are determined by subtracting the scandal window levels from their levels during the two-week window in the July 1–15, 2002 SOX legislation period. There is a statistically significant reduction of eight basis points in quoted spread and three basis points in average effective spread indicating improvements in liquidity upon the passage of SOX. However, dollar depths also decline, leaving no statistically significant change in the liquidity index. Adverse selection components display mixed results as well. While the absolute dollar amount of adverse selection declines with total spreads, the changes are not significant in terms of percentage components of spreads shortly after the passage of SOX.

Table 2

Changes in liquidity measures around scandals and Sarbanes-Oxley events

The results are based on two-week subperiods. The benchmark period subsample is from August 15, 2001 to August 28, 2001; scandal subsamples are from October 1, 2001 to October 12, 2001 (Enron) and June 17, 2002 to June 29, 2002 (Worldcom); the legislation period subsample is from July 1, 2002 to July 15, 2002, and the regulation period subsample is from January 2, 2003 to January 15, 2003. *t*-statistics for the null hypothesis of zero change are in parentheses.

Panel A: Liquidity measures

Event	Benchmark levels	Change after scandals (from benchmark)	Change after legislation—SOX (from scandals)	Change after regulations—SEC (from scandals)
Liquidity measure				
Quoted spread (percentage)	0.33	+0.07*** (8.91)	-0.08*** (-7.37)	-0.07*** (-5.25)
Effective spread (percentage)	0.17	+0.05*** (8.62)	-0.03*** (-3.68)	-0.04*** (-5.45)
Depth (\$ in thousands)	44.90	+1.59 (1.60)	-4.17*** (-4.38)	+29.95*** (19.04)
Liquidity index: depth (\$ in thousands)/quoted spread (%)	334.26	-32.31** (-2.50)	+15.37 (1.49)	+510.81*** (19.44)
Adverse selection component (percentage) Glosten and Harris (1988)	33.85	+3.31*** (9.14)	+0.42 (1.26)	-5.08*** (-12.32)
Adverse selection component (cents) Glosten and Harris (1988)	2.34	+0.38*** (7.59)	-0.50*** (-11.40)	-1.30*** (-20.20)
Adverse selection component (cents) Huang and Stoll (1997)	1.87	+0.20** (2.06)	-0.52*** (-5.14)	-0.81*** (-6.62)

Panel B: Control variables

Event	Benchmark levels	Change after scandals (from benchmark)	Change after legislation—SOX (from scandals)	Change after regulations—SEC (from scandals)
Control variable				
Daily abnormal return (%)	0.12	-0.43*** (-7.44)	-0.30*** (-4.21)	+0.29*** (4.48)
Average daily volume in millions (\$)	32.50	+11.47*** (8.43)	+1.40 (1.10)	-7.73*** (-5.00)
Volatility	0.0178	+0.0109*** (15.22)	+0.0012 (1.28)	-0.0051*** (-5.87)

***, ** indicate statistical significance at the 0.01 and 0.05 level, respectively.

One explanation for these mixed results is that the capital markets were still negatively influenced by a wave of financial scandals in the second quarter of 2002, and the passage of SOX did not have an immediate impact. Another plausible reason is that many important provisions of SOX that were expected to have liquidity impacts either became effective in 2003 or were applied to the end of the 2002 financial

statements (e.g., executive certification requirements). Detection of a significant negative abnormal return and a significant increase in stock volatility during the legislation period, as seen in Panel B of Table 2, supports the explanation that the immediate market effects of SOX were not felt by market makers.

6.1.3. Long-run liquidity effects of regulations (SEC rules)

The last column of Table 2 presents the long-term liquidity effects of regulatory actions. Here again the changes are calculated by subtracting the scandal window levels from their levels in the two-week window during the SOX regulation period, January 2–15, 2003. SOX directed the SEC to establish implementation rules within 270 days pursuant to its passage. Many rules applied to the financial statements for the fiscal year ending in 2002. Those statements were released by companies in the first quarter of 2003. The implementation of SOX provisions is associated with improved liquidity measures. The quoted and effective spreads decline by seven and four basis points, respectively, from their levels after the financial scandals. Depth also improves by almost \$30,000 in the regulatory period. The net result is a significant improvement in the liquidity index. The results are statistically significant at the 1% level. The measures are not only much better than those after the financial scandals, but also beat the benchmark liquidity levels.

We examine the observed changes in liquidity by types of traders (e.g., small, medium, large) and find no statistically significant differences across groups (details available from the authors). The adverse selection component of spreads declines substantially for all types of traders (small, medium, large) in both the short term and long term after the passage of SOX. These results underscore the perception that all types of investors (less sophisticated, more informed) were adversely affected by reported financial scandals, and thus, congressional and regulatory responses were intended to reverse such negative impacts.

6.1.4. Analysis of control variables

We control for firm-specific cross-sectional variables suggested in the literature (e.g., Huang and Stoll, 1996) using variables, such as price, volatility, and trading volume, as well as several important market microstructure events that occur during our test period (e.g., Nasdaq's Super Montage, NYSE's automated system). Panel B of Table 2 reports a negative abnormal return immediately after the passage of SOX and substantial positive security price reactions after the subsequent issuance of SEC rules. The results are consistent with those of Li, Pincus and Rego (2008), showing positive market reactions to several events after the passage of SOX. Volumes increase (decrease) significantly during the scandal (legislation) period. This appears consistent with Easley and O'Hara (1992), in which market makers use trading volume as a signal that an information event has occurred. Volatility changes are positive and statistically significant both during the scandal period and after the passage of SOX. Although the liquidity measures improve monotonically in the long term after the

passage of SOX, there are no monotonic changes in the control variables that could explain the changes in liquidity measures.

6.2. Regression analysis

6.2.1. Changes in market liquidity in the scandal, legislation and SEC regulation periods

The regressions in Table 3, Panel A indicate that scandals adversely affect market liquidity. The coefficients for financial scandal variables are statistically significant in all regressions; they have a positive sign in spreads-based inverse liquidity measure regressions and a negative sign in direct depth-based regressions, suggesting that market liquidity deteriorates during the scandal period. Results for the legislation period are mixed. Although quoted spreads decline, the changes in effective spreads and adverse selection components are statistically insignificant. Depths narrow as well, suggesting no clear improvements in market liquidity in the short term. The long-term effects of the SOX regulations are unequivocal. The SEC regulation variable has consistent statistical significance at the 1% level. The coefficients on the SOX indicator variable are negative for spread-based inverse liquidity measures and positive for the depth-based direct liquidity measure. The results suggest an overall improvement in market liquidity after SOX implementation, consistent with the act and SEC implementation improving the reliability of financial reports, thereby reducing information asymmetry and improving market liquidity.

We repeat the regression analysis by starting our sample period in February 2002 in Panel B instead of the original starting point of May 2001 used in Panel A. The purpose is to address key concerns regarding two major events. First, the results in Table 3, Panel A could be tainted by the market closures and uncertainties related to the 9/11 attacks, which fall in the middle of the sample. NYSE also introduced OpenBook in the beginning of 2002, which Boehmer, Saar and Yu (2005) find to be a liquidity-improving structural change. Although Panel B misses the Enron scandal, it includes the next biggest accounting scandal by WorldCom, SOX legislation and SEC regulation. This permits a cleaner analysis untainted by two major historic events relevant to liquidity. The direction, magnitude, and statistical significance of the coefficients in Panel B of Table 3 are similar to those in Panel A. Spreads widen and depths narrow in response to scandals. SOX restores liquidity, particularly in the long run.

6.2.2. Linkage between liquidity and earnings quality

Table 4 presents the results on the linkage between post-SOX liquidity improvements and post-SOX earnings quality improvements. We calculate the change (Δ) in each variable resulting from SOX by subtracting the pre-SOX average from the post-SOX average for each stock. The coefficients on normalized accruals are positive and statistically significant for both quoted spreads. A 1% increase in accruals increases quoted spreads by 0.75 basis points and effective spreads by 0.41 basis points.

Table 3

Panel regressions explaining changes in liquidity due to financial scandals and Sarbanes-Oxley

The sample contains 610 firms first affected by SOX. Daily average percentages quoted spread, percentage effective spread, and dollar adverse selection component of spreads are inverse liquidity measures whereas log of quoted depth and depth-to-spread ratio are direct liquidity measures. Panel A uses the full sample and Panel B uses a truncated period for robustness.

$$Liquidity\ Measure = \beta_0 + \beta_1\ Scandals + \beta_2\ SOX\ Legislation + \beta_3\ SEC\ Regulation + \beta_4\ Inverse\ price + \beta_5\ Log\ volume + \beta_6\ Price\ volatility + \beta_7\ Log\ firm\ size + \epsilon, \tag{4}$$

where *Scandals*, *SOX Legislation*, and *SEC Regulation* are dummy variables equal to one for the respective nonoverlapping periods (defined in Figure 1); *Inverse price* is the reciprocal of the average of bid price and ask price; *volume* is the dollar daily trading volume; and *firm size* is the dollar market capitalization of the stock. *t*-statistics using White's (1980) heteroskedasticity-consistent standard errors are in parentheses.

Panel A: Entire sample period from May 2001 to April 2003

Dependent variable	Proportional quoted spreads in basis points (inverse liquidity measure)	Proportional effective spreads in basis points (inverse liquidity measure)	Adverse selection component (\$) Glosten and Harris (1988)	Log \$depth (direct liquidity measure)	Log depth (\$) to spread (%) ratio (direct liquidity measure)
Explanatory variable					
Intercept	-11.2470*** (-33.27)	-6.7021*** (-18.46)	-0.7686*** (-6.16)	-41.9551*** (6.42)	10.1112 (1.48)
Financial scandals	0.0215*** (5.23)	0.0204*** (4.80)	0.0014** (2.35)	-0.2746*** (-5.20)	-0.3781*** (-6.69)
Sarbanes-Oxley (SOX) Act legislation	-0.0156*** (-2.64)	-0.0149 (-1.63)	0.0010 (0.87)	-0.3699*** (-7.36)	-0.3299*** (-6.12)
SEC rules implementation	-0.0182*** (-6.05)	-0.0221*** (-4.58)	-0.0038*** (-6.29)	0.4461*** (11.52)	0.5091*** (12.69)
Inverse of price midpoint	31.5320*** (40.63)	19.8835*** (25.77)	1.2616*** (7.42)	51.7366*** (5.14)	-70.6455*** (-6.69)
Price volatility	0.0025*** (8.88)	0.2261*** (4.63)	0.0266*** (3.92)	0.2586 (0.83)	-0.5656* (-1.77)
Log of dollar volume	-0.0147** (-2.50)	-0.0118 (-1.63)	0.0001 (0.10)	0.2484*** (4.08)	0.3074*** (4.82)

(continued)

Table 3 (continued)

Panel regressions explaining changes in liquidity due to financial scandals and Sarbanes-Oxley					
	0.6630*** (37.14)	0.3965*** (21.20)	0.0454*** (6.81)	2.6439*** (7.28)	-0.0214 (-0.06)
Adjusted R ²	85.32%	66.07%	34.40%	65.96%	72.81%
<i>Panel B: From February 2002 to April 2003 after NYSE OpenBook and entirely after 9/11</i>					
Dependent variable	Proportional quoted spreads in basis points (inverse liquidity measure)	Proportional effective spreads in basis points (inverse liquidity measure)	Adverse selection component (\$) Glosten and Harris (1988)	Log \$depth (direct liquidity measure)	Log depth (\$) to spread (%) ratio (direct liquidity measure)
Explanatory variable					
Intercept	-10.1140*** (-12.18)	-7.4660*** (-5.73)	-0.4209*** (-2.75)	-12.5954 (-0.72)	41.3836** (2.26)
Financial scandals	0.0220*** (4.81)	0.0204*** (2.68)	0.0002 (0.32)	-0.4097*** (-4.40)	-0.5256*** (-5.32)
Sarbanes-Oxley (SOX) Act legislation	-0.0058 (-1.01)	-0.0100 (-0.97)	0.0015 (1.32)	-0.3221*** (-5.20)	-0.3057*** (-4.58)
SEC rules implementation	-0.0233*** (-7.52)	-0.0248*** (-4.04)	-0.0043*** (-6.14)	0.4021*** (9.46)	0.4876*** (10.98)
Inverse of price midpoint	29.1545*** (18.42)	0.2128*** (-9.19)	0.8361*** (3.20)	42.5953 (1.47)	-107.3575*** (-3.64)
Price volatility	0.0015*** (4.94)	0.0019*** (2.57)	0.0218*** (2.75)	-0.3476 (-0.84)	-0.8844** (-2.02)
Log of dollar volume	-0.0105 (-1.23)	-0.0124 (-1.04)	-0.0004 (-0.34)	0.3372*** (3.50)	0.3792*** (3.89)
Log of market capitalization	0.5940*** (11.96)	0.4420*** (5.49)	0.0254*** (2.75)	0.5481 (0.53)	-1.9527* (-1.80)
Adjusted R ²	88.32%	61.69%	46.14%	46.62%	69.25%

***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively.

Table 4

Regressions for the earnings-quality effects of Sarbanes-Oxley on liquidity

This table presents the results of the following regression model in a cross-sectional framework:

$$\Delta \text{Liquidity measure} = \beta_0 + \beta_1 \Delta(TACC) + \beta_2 \Delta(1/Price) + \beta_3 \Delta \text{Return volatility} + \beta_4 \Delta \text{Log}(\text{Dollar trading volume}) + \beta_5 \Delta \text{Log}(\text{Market value of equity}) + \varepsilon, \tag{5}$$

where Δ indicates the change in the value of each variable resulting from SOX, obtained by subtracting the pre-SOX average from the post-SOX average for each stock; *five liquidity measures are used as dependent variable in separate regressions*; $TACC_{i,t}$ is the total accruals divided by total assets of stock i in year t ; $Price_{i,t}$ is the mean price of stock i in year t ; $\text{Return volatility}_{i,t}$ is the SD of daily closing quote midpoint returns of stock i in year t ; $\text{Dollar trading volume}_{i,t}$ is the mean daily dollar trading volume of stock i in year t ; $\text{Market value of equity}_{i,t}$ is the market value of equity of stock i at the beginning of year t ; and $\varepsilon_{i,t}$ is the error term. t -statistics using White's (1980) heteroskedasticity-consistent standard errors are in parentheses.

	Δ Liquidity measure				
	% Quoted spread	% Effective spread	Adverse selection component (\$)	Depth (\$)/quoted spread (%)	
			Glosten and Harris (1988)	Log \$depth	
Intercept	-0.0720*** (-3.11)	-0.0308** (-2.12)	-0.1161** (-2.02)	0.4907*** (8.76)	12.0258*** (5.50)
$\Delta TACC$	0.7544*** (2.17)	0.4098* (1.88)	0.9751** (2.14)	-0.6198** (-2.39)	-16.9329* (-1.85)
$\Delta Price$	-0.0016 (-0.91)	-0.0012 (-0.88)	0.0040 (0.58)	0.0046 (0.88)	0.4409 (1.39)
$\Delta Volatility$	-0.5029*** (-2.76)	-0.2612** (-2.51)	-1.1109** (-2.55)	-0.6575 (-0.74)	-62.7852 (-1.28)
$\Delta Dollar volume$	0.0052 (1.16)	0.0036 (1.33)	0.0202 (1.61)	-0.0381 (-1.27)	-0.4104 (-0.30)
$\Delta Market value$	-0.2186** (-2.26)	-0.1487** (2.34)	-0.0475 (-0.51)	0.0310 (0.38)	-0.2871 (-0.09)
Adjusted R^2	9%	7%	1%	2%	1%
N	491	491	491	457	457

***, **, * indicate statistical significance at the 0.01, 0.05 and 0.10 level, respectively.

Similarly, a 1% drop in accruals reduces the trading cost by a similar magnitude. The economic significance of this relation is apparent as the stocks in our sample have average quoted spreads of 33 basis points and effective spreads of 17 basis points.

We interpret the reduced spreads as the result of reduced accruals and improved financial reporting. This interpretation is supported by the next regression where the adverse selection component is the dependent variable. This regression more directly captures the information environment. The impact of $\Delta TACC$ is even bigger for the adverse selection component of spreads both in absolute and relative terms. In the depth and liquidity index regressions, the coefficients on $TACC$ are negative and statistically significant as expected. When accruals are low, suggesting better quality of financial reports, market makers increase the depths, thus improving liquidity. These results imply that liquidity improvements induced by SOX are associated with improved earnings quality. We leave in-depth analysis of the effects of SOX on earnings quality to future research.

6.3. Limitations and robustness checks

Our findings as to the extent to which SOX improved market-wide liquidity should be interpreted with caution for several reasons. First, confounding events and market conditions that could affect liquidity cannot be completely ruled out. We search the *Wall Street Journal*, the *Wall Street Journal index*, and the *New York Times* to identify any such events that might affect stock prices during our test period. We find that business and accounting scandals, SOX, the likelihood of its passage, and its possible effect on restoring investor confidence and prevention of future scandals were the main news items associated with market movements during the test period.

Second, our sample is potentially affected by clustering of events and by heteroskedasticity. We address these econometric concerns by calculating White's (1980) corrected standard errors and by using bootstrapping techniques. The statistical significance for all of the coefficients in our regressions holds in these robustness checks. Keep in mind that our focus is on liquidity and that we suggest that better earnings quality is a conduit through which SOX improves liquidity. We leave a more in-depth explanation of how SOX affects earnings quality, which is not our main research question.

Finally, we perform a robustness test to determine whether SOX and SEC-related implementation rules affect public companies differently depending on their extent of compliance with SOX provisions prior to its passage. First, we use the S&P corporate governance scores to form two portfolios of more-compliant and less-compliant firms based on whether they were "close to" or "far from" compliance with SOX prior to its passage. Second, we calculate all measures of market liquidity for all five events presented in Table 2. Third, we compare liquidity measures of these two portfolios (not tabulated). We find that: (1) both more compliant and less compliant portfolios exhibit improvements in liquidity after the passage of SOX; and (2) the more compliant portfolio experiences more liquidity improvements than the less compliant portfolio.

These findings are consistent with those of Jain and Rezaee (2006) and Bushee and Leuz (2005) that regulations tend to create more benefits for more compliant firms than less compliant firms.

7. Conclusion

Financial market participants, particularly investors, market makers and other liquidity providers must trust the quality, integrity, reliability and transparency of financial reports by public corporations. Numerous reported corporate and accounting scandals, business failures of high-profile companies, falling investor confidence in the capital markets, substantial losses by investors and perceived inadequate market-based correction mechanisms persuaded Congress to pass SOX. We investigate the possible effects of financial scandals, congressional responses and regulations on market liquidity in the pre-SOX and post-SOX periods. We report that market liquidity measures deteriorate after the wave of financial scandals, suggesting that liquidity providers perceived that their adverse selection risks increased.

SOX and SEC implementation rules were established with the goals of improving the reliability of public financial information and restoring investor confidence in financial reports and the capital markets. We find that market liquidity measures improve significantly, particularly in the long term, after the passage of SOX and the establishment of SEC implementation rules, suggesting that the reforms were successful in restoring market participants' confidence in public financial information. We find that the detected improvements in market liquidity are more pronounced for firms that were closer to compliance with SOX provisions before the passage of the act.

Regression results indicate that the detected changes in liquidity measures are associated with financial scandals in the pre-SOX period and SEC implementation rules in the post-SOX period. The results support a positive relation between the observed improvements in market liquidity and the quality of financial reports measured in total accruals in the post-SOX period. These results are consistent with the view that SOX, by improving the reliability of financial reports, reduced information asymmetry, which in turn resulted in improved market liquidity. Firm size, stock price volatility and volume were positively related to the observed improvements in market liquidity in the post-SOX period, which suggests that larger firms experience more benefit from SOX compliance than smaller firms.

References

- Anderson, K.L. and T.L. Yohn, 2003. The effect of 10-K restatement on firm value, information asymmetries, and investors' reliance on earnings. *Working paper*, Georgetown University.
- Bacidore, J., R. Battalio, and R. Jennings, 2003. Order submission strategies, liquidity supply, and trading in pennies on the New York Stock Exchange, *Journal of Financial Markets* 6, 337–362.
- Boehmer, E., G. Saar, and L. Yu, 2005. Lifting the veil: An analysis of pre-trade transparency at the NYSE, *Journal of Finance* 60, 783–815.
- Bushee, B.J. and C. Leuz, 2005. Economic consequences of SEC disclosure regulation: Evidence from the OTC bulletin board, *Journal of Accounting and Economics* 39, 233–264.

- Chakravarty, S., R. Wood, and R. Van Ness, 2004. Decimals and liquidity: A study of the NYSE, *Journal of Financial Research* 27, 75–94.
- Chiyachantana, C.N., C.X. Jiang, N. Taechapiroontong, and R.A. Wood, 2004. The impact of Regulation Fair Disclosure on information asymmetry and trading: An intraday analysis, *The Financial Review* 39, 549–577.
- Coates, J.C., 2007. The goals and promise of the Sarbanes-Oxley Act, *Journal of Economic Perspectives* 21 (Winter): 91–116.
- Cohen, D.A., A. Dey, and T.Z. Lys, 2004. The effect of the Sarbanes-Oxley Act on earnings management: What has changed? 2004 Annual Meeting of the American Accounting Association (AAA). Orlando, FL, August 8–11.
- Committee on Capital Markets Regulation, 2006. Interim report of the Committee on Capital Markets Regulation (November 30). www.capmksreg.org/research.html.
- Crutchley, C.E., M.R.H. Jensen, and B.B. Marshall, 2007. Climate for scandal: Corporate environments that contribute to accounting fraud, *The Financial Review* 42, 53–73.
- Cunningham, L.A., 2003. The Sarbanes-Oxley yawn: Heavy rhetoric, light reform (and it just might work), *Connecticut Law Review* 35 (Spring), 915–988.
- Dechow, P. and I. Dichev, 2002. The quality of accruals and earnings: The role of accrual estimation errors. *Accounting Review* 77(Supplement), 35–59.
- Diamond, D.W. and R.E. Verrecchia, 1991. Disclosure, liquidity, and the cost of capital, *Journal of Finance* 46, 1325–1359.
- Donaldson, W.H., 2005. Speech by SEC Chairman: Remarks before the Financial Services Roundtable. *U.S. Securities and Exchange Commission* (April 1). <http://www.sec.gov/news/speech/spch040105whd.htm>.
- Easley, D. and M. O'Hara, 1992. Time and the process of security price adjustment, *Journal of Finance* 47, 577–605.
- Eleswarapu, V.R., R. Thompson, and K. Venkataraman, 2004. The impact of Regulation Fair Disclosure: Trading costs and information asymmetry, *Journal of Financial and Quantitative Analysis* 39, 209–225.
- Findlay, S. and P.G. Mathew, 2006. An examination of the differential impact of regulation fd on analysts' forecast accuracy, *The Financial Review* 41, 9–31
- Forbes, 2002. *The Corporate Scandal Sheet*. <http://www.forbes.com/home/2002/07/25/accountingtracker.html>.
- Glosten, L.R. and L.E. Harris, 1988. Estimating the components of the bid-ask spread, *Journal of Financial Economics* 21, 123–142.
- Glosten, L.R. and P.R. Milgrom, 1985. Bid, ask, and transaction prices in a specialist market with heterogeneously informed traders, *Journal of Financial Economics* 14, 71–100.
- Harris, M. and A. Raviv, 1993. Differences of opinion make a horse race, *Review of Financial Studies* 6, 473–506.
- Heflin, F., K.W. Shaw, and J.J. Wild, 2002. Disclosure quality and market liquidity. *Working paper*, Robert H. Smith School of Business.
- Hribar, P. and D.W. Collins, 2002. Errors in estimating accruals: Implications for empirical research, *Journal of Accounting Research* 40, 105–134.
- Huang, R.D. and H.R. Stoll, 1996. Dealer versus auction markets, *Journal of Financial Economics* 41, 313–357.
- Huang, R.D. and H.R. Stoll, 1997. The components of the bid-ask spread: A general approach, *Review of Financial Studies* 10, 995–1034.
- Jain, P.K. and Z. Rezaee, 2006. The Sarbanes-Oxley Act of 2002 and security market behavior: Early evidence, *Contemporary Accounting Research* (Autumn) 23, 629–654.
- Jo, H. and Y. Kim, 2007. Disclosure frequency and earnings management, *Journal of Financial Economics* 84 (May), 561–590.
- Kyle, A., 1985. Continuous auctions and insider trading, *Econometrica* 53, 1315–1335.

- La Porta, R., F. Lopez-De-Silanes, A. Shleifer, and R. Vishny, 1998. Law and finance, *Journal of Political Economy* 106, 1113–1155.
- La Porta, R., F. Lopez-De-Silanes, A. Shleifer, and R. Vishny, 2002. Investor protection and corporate valuation, *Journal of Finance* 57, 1147–1170.
- Lee, C.M.C., B. Mucklow, and M.J. Ready, 1993. Spreads, depths, and the impact of earnings information: An intraday analysis, *Review of Financial Studies* 6, 345–374.
- Li, H., M. Pincus, and S.O. Rego, 2008. Market reaction to events surrounding the Sarbanes-Oxley Act of 2002 and earnings management, *Journal of Law and Economics* (forthcoming).
- Myers, S. and N. Majluf, 1984. Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13, 187–221.
- Osterland, A., 2002. No more Mr. Nice Guy: A CFO survey suggests that recently passed rules for auditors may be a wise idea, *CFO Magazine*, pp. 1–7. <http://www.cfo.com/article.cfm/3006158?f=search>.
- Rezaee, Z., 2002. *Financial Statement Fraud: Prevention and Detection* (John Wiley & Sons, New York).
- Rezaee, Z., 2004. Corporate governance role in financial reporting, *Research in Accounting Regulation* 17, 107–149.
- Sarbanes-Oxley Act of 2002. The Public Company Accounting Reform and Investor Protection Act. <http://www.whitehouse.gov/infocus/corporateresponsibility>. (H.R. 3763).
- Sarbanes, P., 2006. Senator Paul S. Sarbanes' Remarks on the Sarbanes-Oxley Act before Consumer Federation of America Lifetime Consumer Hero Award (March 23). <http://www.uspirg.org/consumer/archives/sarbanescfa.pdf>.
- White, H., 1980. A heteroskedasticity-consistent covariance estimator and a direct test for heteroskedasticity, *Econometrica* 48, 817–838.