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Informedness and Consensus of Accounting Information post  
Sarbanes-Oxley Act: High-Tech Firms versus Low-Tech Firms

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# **Informedness and Consensus of Accounting Information post Sarbanes-Oxley Act: High-Tech Firms versus Low-Tech Firms**

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## Abstract

*This paper draws upon the theory on the price and volume behavior developed by Holthausen and Verrecchia (1990) and examines the informedness and consensus of accounting information post Sarbanes-Oxley Act. The theory predicts that when common noise in accounting information increases, the informedness decreases but the consensus increases. In addition, this decrease in informedness is associated with a decrease in stock return variability and a decrease in trading volume whereas the increase in consensus is associated with an increase in the stock return variability and a decrease in trading volume. Consistent with these predictions, we find that trading volume has decreased post SOX for both high-tech and low-tech firms when we investigate investors' response during a short window around quarterly report dates. Since the effects of informedness and consensus on trading volume are reinforcing, the decrease in trading volume should be found in both high-tech and low-tech samples. However, the effects of informedness and consensus on the stock return variability are countervailing, and therefore any decrease or increase in stock return variability depends upon which of the two effects dominates in a particular informational setting. The decrease in stock return variability is found only in the high-tech firms, which can be explained by the implementation of more conservative accounting methods in the high-tech sector.*

**Keywords:** High-Tech, Informedness, Consensus, Sarbanes-Oxley Act

Data Availability: *Data used in this study are available from public sources identified in the paper*

## 1. Introduction

This study investigates the effects of the Sarbanes-Oxley Act (hereafter SOX) on financial statements informedness and investors' consensus about the signal presented in the information. Informedness is defined as the extent to which financial statement users become more knowledgeable about the firm's expected dividends, and consensus is defined as whether these users agree on the signal presented in the accounting information, upon the release of financial statements (Holthausen and Verrecchia 1990).<sup>1</sup> One of the main objectives of SOX is to restore

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<sup>1</sup> In this paper, we use such terms as informedness and information content interchangeably. Also, the terms of reliability and credibility are interchangeably used. It is implicitly assumed that both relevance and reliability affect

investor confidence through a series of new reporting requirements such as disclosure of internal controls effectiveness, an increase in transparency regarding off-balance sheet accounting, and certification of financial statements by chief executive officers and chief financial officers.<sup>2</sup> It is therefore constructive to examine whether the reforms have an impact on investors' use of financial statements.

Recent studies on the effects of SOX on financial reporting find that accounting numbers became more conservative when compared with the period prior to the regulation. Lobo and Zhou (2006) find that firms report lower discretionary accruals and report losses more quickly than gains when they report income after SOX. Cohen et al. (2005) also report that firms have significantly higher discretionary accruals prior to SOX and discretionary accruals decrease after the passage of SOX. These results provide evidence that management may have responded to the regulation by reducing aggressive earnings management behavior. The results are also consistent with increasing litigation costs following SOX, which decreases management's incentives to report aggressive accounting results. To the extent that accounting becomes more conservative, reliability of such information will increase, however, it could also be at the expense of relevance since firms will be reluctant to provide forward-looking information that is less verifiable or use accruals to signal future performance.<sup>3</sup> Our study extends these recent studies and investigates whether the informedness and consensus of financial information have changed due to the increase in reliability in accounting reports.

We follow the framework developed by Holthausen and Verrecchia (1990) (HV thereafter) to examine change in informedness and consensus by computing the stock return variability and trading volume during a short

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informedness because relevance and reliability are two primary information qualities identified by the Financial Accounting Standards Board (FASB) in Statement of Financial Accounting Concepts No. 2

<sup>2</sup> For details, see Title IV – Enhanced Financial Disclosures of the Sarbanes-Oxley Act.

<sup>3</sup> Johnson et al. (2001) evaluate corporate voluntary disclosure of forward-looking information under the safe harbor provision of the Private Securities Litigation Reform Act of 1995. Examples of forward-looking information include earnings projections, sales projections, market share projections, and other financial projections & statements.

window of quarterly report dates (10-Q) and compare the metrics pre- and post-SOX. Holthausen and Verrecchia (1990) posit that both stock return variability and trading volume are valid metrics to examine the effects of information releases. When a common event such as SOX affects the noise in estimating firms' expected dividends, both informedness and consensus change.<sup>4</sup> Specifically, when the variance of common noise is increased, informedness decreases but consensus increases. Such phenomena will manifest in the change in stock price variability depending on which force dominates. If the informedness (consensus) effect dominates, stock price variability will decrease (increase). However, trading volume unambiguously decreases when informedness decreases and consensus increases. Previously, Ohlson (1979) derives a theoretical rationale for a link between information disclosures and stock prices. He shows that stock prices reflect higher variance during the information release period when the reporting environment contains more useful information to the investors. Bushee et al. (2004) recently examine the information content of conference calls following Regulation Fair Disclosure and find that both stock price variability and trading volume have increased for their sample firms. Following this line of research, we examine the change in stock price volatility and trading volume post SOX.

We posit that firms with higher expected litigation costs are more likely to be affected by SOX and thus report more conservative accounting information.<sup>5</sup> Firms in the high-tech industry are believed to be riskier and

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<sup>4</sup> As Holthausen and Verrecchia (1990) indicate, investors do not observe the common and idiosyncratic components of noise separately. In this paper, we assume that the idiosyncratic noise which arises from differences in age, abilities, sex, education levels, career experience, character, and other factors unique to each investor does not systematically change as a result of common public event such as SOX.

<sup>5</sup> Recent studies identify two types of accounting conservatism. The first type is ex ante conservatism, which is also called balance sheet related, unconditional, or news independent conservatism (Beaver and Ryan 2004; Chandra et al. 2004; and Richardson and Tinaikar 2004). Ex ante conservatism reflects the understatement of book values of net assets through the application of GAAP or a firm's policies that reduce earnings independent of current financial and economic news (e.g., the immediate expensing of R&D and advertising expenditures, and the accelerated depreciation of property, plant, and equipment). The second type of conservatism is ex post conservatism, which is also called income statement related, conditional, or news dependent conservatism (Richardson and Tinaikar 2004; Pae et al. 2005; Chandra et al. 2004; Beaver and Ryan 2004, Basu 1997; and Ball and Shivakumar 2006). Ex post conservatism is associated with the more timely recognition of economic losses than gains, consistent with the

are associated with higher litigation costs (Jones and Raghunanda 1998; Johnson, Kasznik and Nelson 2001). Furthermore, firms with higher litigation costs are more likely to engage in conservative accounting (Watts 2003). Kwon, Yin and Han (2006) also find that high-tech firms are more conservative in their accounting relative to low-tech firms. Therefore, we hypothesize that firms in the high-tech industry are more likely to be affected by SOX than low-tech firms. Accordingly, we test stock price variability and trading volume behavior separately for these two industries.

Our sample includes 365 high-tech firms and 74 low-tech firms with available data from 1998 to 2004. We examine the market reaction to quarterly reports (10-Q) one quarter prior to SOX and one quarter post SOX and find that both stock price variability and trading volume (or its variability) have significantly decreased for high-tech firms in both univariate and multivariate tests, suggesting that the decrease in informedness is accompanied by an increase in consensus. The increase in consensus is further supported by the decrease in analysts' forecast dispersion. Moreover, the informedness effect outweighs that of consensus for high-tech firms. The results are, however, inconclusive for low-tech firms. Although we find a reduction in trading volume for low-tech firms, there is no change in stock price variability. The results together suggest that the informedness of accounting information has decreased more than the increase in consensus of such information in high-tech firms, but not in low-tech firms. We interpret the results as the possibility that high-tech firms, facing higher litigation costs, adopt more reliable reporting and forego voluntary disclosure of more relevant but less accurate information in their accounting reports.<sup>6,7</sup>

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definition of Basu (1997). The conservatism measures adopted in this paper are consistent with the definition of ex post conservatism because they directly relate to managerial discretion/manipulation in financial reporting.

<sup>6</sup> Studies on accounting numbers' informativeness generally do not separate the effect of change in relevance and reliability. The validity of our interpretation that the decrease in relevance is greater than the increase in reliability is based on the assumption that SOX in general promotes higher reliability in financial information. As the results in both stock price variability and trading volume (or its variability) tests indicate lower informedness, we interpret the results as the decrease in relevance dominating the increase in reliability. Several recent studies that investigate the impact of SOX on reported financial information also support the view that the intention of SOX was to increase financial statement accuracy (reliability). These studies include, among others, Heflin and Hsu (2004), Cohen et al. (2005), Lobo and Zhou (2006), and Li et al. (2006).

The empirical tests based upon non-operating accruals and performance-matched discretionary accruals as proxies to measure accounting conservatism, as well as the Basu (1997) measure of conservatism are consistent with the above conjecture that the increased level of conservatism in financial reporting is more for high-tech firms than for low-tech firms following SOX.

This paper's contribution to existing literature is in the following three areas. First, Holthausen and Verrecchia (1990) note that when information is disseminated or acquired, the variances of the common and idiosyncratic components of agents' information affect the level of informedness and the degree of consensus simultaneously. As the variance of the common component increases, informedness tends to be reduced because the greater noise in agents' information makes them less knowledgeable about the firms' expected dividends. Simultaneously, an increase in common noise is likely to increase consensus across agents because their estimation error will be highly correlated. Previous studies on mandatory disclosures focus on stock price reaction and do not separate out informedness from consensus effects (Ettredge et al. 2002 and Berger et al. 2003 on SFAS 131). Using the unique setting of SOX which changes the reporting environment across the market, we provide empirical evidence relating to the effects of informedness and consensus by examining trading volume behavior in addition to stock price variability at the time of public disclosures, supporting HV's theoretical model.

Second, we provide evidence that the new disclosure requirements under SOX have more impact on firms with higher expected litigation costs. Ashbaugh-Skaife et al. (2006) provide evidence that SOX disclosures have more impact on the reduction in cost of capital for firms that are most likely to have internal control deficiencies and receive their first unqualified SOX

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<sup>7</sup> Ogneva et al. (2007) examine the association between cost of equity and internal control weakness for firms that filed first-time Section 404 reports with the SEC. They conclude internal control weaknesses are not directly associated with higher cost of equity. Their results are inconsistent with regulators' position that the internal control

reports and no such evidence is found with firms that are less likely to have internal control deficiencies. We find that firms with higher expected litigation costs (high-tech firms) are more likely to respond to SOX by reporting less relevant but more reliable financial information.<sup>8</sup> Therefore, the effects of SOX likely differ according to firm characteristics.

Third, the evidence of differential market reactions between high-tech and low-tech firms to post-SOX disclosures and the evidence of changes in conservatism levels between pre- and post-SOX periods for high-tech firms have the potential to provide useful SOX feedback to regulators.

The remainder of this study is organized into four sections. The second section develops the hypotheses by exploring and discussing previous relevant research. The third section describes sample selection procedures and research design. Section four presents the results of empirical tests on stock price variability, and trading volume variability between pre-SOX and post-SOX periods for high-tech versus low-tech firms. Concluding comments can be found in the final section.

## **2. Hypotheses Development**

### **2.1 Theoretical models on information and market reaction**

Ohlson (1979) provides an analytical model that links additional information disclosure and stock price variability under a setting of uncertainty. In his model, information is viewed as a state descriptor helpful in assessing the probability distribution of states in a capital asset valuation model. As information becomes publicly available in financial reporting, investors can be expected to update their beliefs (i.e., their prior probability distributions about the changed states of nature). Using a simple linear

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requirements of Section 404 of SOX should result in higher quality financial reporting, which in turn should lower cost of capital.

<sup>8</sup> Dye and Sridhar (2004) argue, “Reliability-relevance trade-offs arise because as the accountant places more weight on the manager’s report, potentially more useful information gets included in the report, at the cost of encouraging the manager to distort his or her information (reduced reliability) to a greater extent. Capital market participants anticipate this behavior price the firm accordingly.” Scott (2006) also indicates, “Complete relevance and reliability are no longer jointly attainable without ideal conditions (i.e., capital markets are complete, certain, and perfect). One must be traded off against the other.”

asset pricing model (which is assumed to specify the information dynamics), Ohlson shows that stock prices have a higher variance when the reporting environment provides more information to enhance estimation of a firm's expected dividends. That is, more state descriptors are revealed in a reporting environment yielding a greater revision of previous predictions of probabilities and outcomes.

In addition, using a two-period rational expectations model in which investors are diversely informed and differ in the precision of their private information, Kim and Verrecchia (1991) demonstrate that stock return variability at the time of a public disclosure increases with the information content of the disclosed information and decreases with the amount of the preannouncement public and private information. In other words, investors respond stronger to the disclosure as the quality of the disclosed information (finer information environment) increases. Consistent with the predictions made in these theoretical studies, Swaminathan (1991), Lobo et al. (1998) and Kwon (1993) find significant stock price reactions at the time of release of the line-of-business information, SFAS No. 14 segment information, and inflation-adjusted information disclosures relating to Accounting Series Release No. 190, respectively. More recently, Bushee et al. (2004) find stock price variability increases during management conference calls with financial analysts after the Regulation Fair Disclosure.

While these models focus on the relation between stock price variability and information disclosure, they do not predict any trading volume reaction in terms of informedness and consensus that generally occur jointly when information is disseminated (Holthausen and Verrecchia 1990). Beaver (1968) finds that earning announcements trigger abnormal trading responses. It is believed, however, that trading volume is a noisier measure than stock price (Kim and Verrecchia 1991). Holthausen and Verrecchia (1990) develop a model to explain how both stock price variability and trading volume are valid metrics to examine effects of information disclosure. Specifically, they propose that there are two effects

simultaneously affecting market response to new information disclosure: informedness and consensus. Informedness is defined as the extent to which financial statement users become more knowledgeable about the firm's expected dividends, and consensus is defined as whether these users agree on the signal presented in the accounting information, upon the release of financial information. More specifically, their model of an information signal consists of three components as follows:

$$Y_a = D + C + I_a$$

During the period, each agent receives an information signal and interprets what the information signal  $Y_a$  implies about the liquidating dividend of the risky asset ( $D$ ).  $D$  has a normal distribution with mean  $m$  and variance  $v$ .  $C$  is a common noise term that has a normal distribution with mean zero and variance  $n$ .  $I_a$  is an idiosyncratic noise term that has a normal distribution with mean zero and variance  $s$ . Furthermore, the idiosyncratic noise terms are assumed to be independent across agents.

Holthausen and Verrechia (1990) argue that as the variance of common noise ( $n$ ) increases, informedness tends to be reduced because greater noise in agents' information makes agents less knowledgeable.<sup>9</sup> Simultaneously, an increase in  $n$  is likely to increase the consensus because the agents' estimation errors are highly correlated. Since an increase in common noise ( $n$ ) works to decrease informedness and increase consensus, the effect of increased common noise on the variance of unexpected price changes is ambiguous, whereas it is likely to decrease trading volume unambiguously.

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<sup>9</sup> In the case of SOX, insofar as managers respond to the new regulation by engaging in conservative financial reporting through increasing the reliability of accounting information disclosures at the expense of more relevant information about future cash flows and increasing the use of income decreasing discretionary accruals to reduce the expected litigation costs, the variance of the common noise component of the agent's information increases because the market agents now have less information (more uncertainty) in assessing a firm's future cash flows. There is also research evidence to indicate that some earnings management has signaling properties (Subramanyam 1996; Tucker and Zarowin 2006). Specifically, earnings management can improve earnings informativeness if managers use their discretion to communicate their assessment of future earnings whereas earnings management makes earnings noisier if managers intentionally distort the earnings numbers.

There are three primary items that are addressed in the Enhanced Financial Disclosure section (i.e., Title IV) of the SOX: the accuracy of financial reporting effectiveness of internal controls, and transparency regarding off-balance sheet accounting. Increasing accuracy of financial reporting and reporting on the effectiveness of internal controls with regard to financial reporting likely will increase reliability of accounting information. Management will have less discretion in manipulating financial results, which is consistent with the results found by Cohen et al. (2005) and Lobo and Zhou (2006). Increasing the transparency in off-balance sheet accounting will provide more relevant, accurate information about the firm's true economic position, thus increasing both the reliability and relevance of financial information.

In addition to these items, there is one general disclosure requirement that directly focuses on the reliability of financial statements – the certification of financial statements by chief executive officers and chief financial officers. In summary, it can be said that these disclosure-related requirements of SOX generally emphasize reliability more than relevance in financial reporting. Therefore, it would be interesting to examine how the effects of these additional disclosures will impact informedness and consensus of financial reporting.

According to Holthausen and Verrechia's (1990) model, we posit that mandatory disclosures aiming at curtailing aggressive accounting behavior and increasing reliability of accounting numbers are likely to change the variance of common noise. More specifically, consensus will increase because the new information is more credible but whether informedness will change remains an empirical question. If firms choose to report more conservative accounting numbers in favor of reliability to lower expected litigation costs then informedness of the firm's future dividends is likely reduced.

Furthermore, firms with higher litigation costs are likely to be more affected by SOX. Recent studies find that high tech firms are riskier and are

more susceptible to higher litigation risks. Johnson et al. (2003) find that high tech firms increased disclosure of management forecasts after the Safe Harbor Act, which protects them from being sued for making forward-looking statements because they face higher litigation costs than low-tech firms prior to the Act. Kwon et al. (2006) also provide evidence that contrary to prior beliefs, high-tech firms report more conservative accounting numbers than low tech firms. They explain that the nature of high-tech businesses may provide one possible reason for these differences. High-tech firms must invest more in such intangible assets as R&D, human resources, customer acquisition, brand development, and other information technology when compared to low-tech firms.<sup>10</sup> To survive in the fast-changing, fiercely competitive high-tech market, these firms also incur greater and more frequent unusual or nonrecurring expenses, including inventory write-downs, restructuring/reorganization expenses, and write-downs or write-offs of receivables and intangibles that potentially lower their earnings reports, thereby reporting more conservative accounting numbers.<sup>11</sup> In addition, Watts (2003) provides arguments that firms with higher litigation costs are more likely to report earnings conservatively. Therefore, combining the expected litigation costs and the nature of more conservative financial reporting, we expect that the regulation will make a greater impact on high-tech firms than low-tech firms.

As such we predict that informedness will decrease while consensus will increase for high tech firms and the effect of informedness will dominate that of consensus. There will also be a change in informedness and consensus for low-tech firms. However, whether the effect of informedness dominates that of consensus is unknown. On the basis of the above

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<sup>10</sup> Prior research uses market-to-book value of asset (MTBA) as a proxy for a firm's growth opportunities (Smith and Watts [1992]) and R&D spending as a percentage of total assets (RNDA) as a proxy for a firm's investment in unrecorded intangible assets (Francis and Schipper [1999]). The average MTBA and RNDA for high-tech (low-tech) firms are 3.2113 (1.9069) and 0.1037 (0.0208), respectively, in this study. The differences in these ratios between the two groups are significant at the .001 level.

<sup>11</sup> Kwon [2002] reports that expenditures on special items in high-tech firms are anywhere between three and twenty-eight times greater than those in low-tech firms during the period of 1990-97.

arguments and predictions, the following hypotheses are developed in their alternate forms:

H1: Stock price variability is lower for high-tech firms in the post-SOX period than in the pre-SOX period during quarterly reporting.

H2: Trading volume is lower for both high-tech and low-tech firms in the post-SOX period than in the pre-SOX period during quarterly reporting.

H3: The level of accounting conservatism is higher for high-tech firms in the post-SOX period than in the pre-SOX period during quarterly reporting.

### **3. Sample Selection and Research Design**

#### **3.1 Sample Selection and Descriptive Statistics**

Financial data are collected from COMPUSTAT, stock return data are obtained from CRSP, and security analysts' forecast data are retrieved from the I/B/E/S file. We collect the announcement dates of 10-Q reports from the SEC's EDGAR database. To compare quarterly reports that were issued around the birth of SOX, the last quarter in the pre-SOX period and the first quarter that reports internal control related information in the post-SOX period are used.<sup>12</sup> The pre-SOX sample period spans three years starting from 1998 fiscal year and ending in 2000 fiscal year, which are matched with the post-SOX sample period that runs from 2002 through 2004 fiscal years. Since the Enron accounting scandal that directly motivated the enactment of SOX took place in 2001, the year was omitted in the pre-SOX sample period determination because of the potential to confound empirical results.<sup>13</sup>

Table 1-A provides the sample selection process. Our high-tech firms sample (HT) combines high-tech firms from Francis and Schipper (1999) and

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<sup>12</sup> All quarterly reports with respect to the disclosure of internal control effectiveness are closely examined around the SOX enactment date. A typical report on internal control effectiveness is presented in Appendix A. Only a few companies (3 out of 144) in the high-tech industries provided an extensive disclosure relating to internal control and procedures. Examples are Bristol-Myers Squibb company (2 pages), Intel Corporation (Appendix B, 2 pages), and Sicom Inc. (11 pages).

<sup>13</sup> On analysis that observations from 2001 are excluded, we repeated our tests with the year in question and the interpretation is qualitatively unchanged.

those listed on the CNNFN.COM (as of July 20, 2000) website. As in Francis and Schipper (1999), we define high-tech firms as those in the computer, electronics, pharmaceutical, and telecommunications industries. We supplement our sample with an additional 22 high-tech firms listed on CNNFN.COM, one of the most popular Internet sites for business news. These procedures result in an initial sample of 2,728 high-tech firms. After eliminating firms with missing observations in return data, forecast data, financial data, and 10-Q dates from the SEC's EDGAR database, we obtain the final high-tech sample that comprises 365 firms. For the low-tech firms sample (LT), the initial 984 low-tech companies selected are similar to those in Francis and Schipper (1999). Excluding missing observations, we secure the final sample of low-tech firms that consists of 74 firms.<sup>14</sup>

Table 1-B presents the distribution of our sample in each industry measured by three-digit SIC codes. Computer and data processing services, electronic components and accessories, drugs, and computer and office equipment industries represent 80% of the high-tech firms. The two most conspicuous industries (more than 46%) in the LT sample include motor vehicles & equipment and general industrial machinery & equipment.

[Insert Tables 1-A and 1-B about here]

Table 2 provides means and medians of financial variables, some forecast related variable (i.e., number of analysts), and results of tests of differences between the pre-SOX period (1998-2000) and the post-SOX period (2002-2004) for both high-tech and low-tech firms. As we expect, the size of operation, measured by net sales deflated by total assets, and market-to-book value of assets (a proxy for a firm's investment opportunities) were significantly lower for both high-tech and low-tech firms. High-tech firms attracted more financial analysts and incurred more selling, general, and administrative expenses per unit of assets whereas low-tech

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<sup>14</sup> Our definitions of high- and low-tech firms are also consistent with those in Kwon (2002) and Kwon and Yin (2006).

firms experienced the opposite with respect to these variables in the post-SOX period.

[Insert Table 2 about here]

Table 3 shows the distribution of 10-Q filing days in both pre-SOX and post-SOX periods for high-tech and low-tech firms. In the quarter right before SOX in 2002, the highest (lowest) frequency for Form 10-Q filing occurred on Wednesday (Thursday) for high-tech firms whereas the highest (lowest) frequency for Form 10-Q filing took place on Tuesday (Friday) for low-tech firms. For the second quarter following SOX, the highest (lowest) frequency for Form 10-Q filing occurred on Tuesday (Monday) for high-tech firms whereas the highest (lowest) frequency for Form 10-Q filing took place on Tuesday (Monday) for low-tech firms.

Figures 1A (1B) concerns the distribution of Form 10-Q filings per day for high-tech (low-tech) firms. As shown in the figures, the highest frequency in the pre-SOX (post-SOX) quarter occurred on May 15 (November 14) for both high-tech and low-tech firms.

[Insert Table 3 and Figures 1A & 1B about here]

### **3.2 Research Design**

The metrics of this paper are developed to test the informedness and consensus of accounting information. Therefore, both price and volume variability metrics will be constructed. We use three price variability metrics (Patell 1976, Beaver 1968, and McNichol and Manegold 1983) and two trading volume metrics to measure market reactions.<sup>15,16</sup>

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<sup>15</sup> Scholes and Williams (1977) suggest that the econometric problem of errors-in-variables may exist due to non-synchronous measurement of returns of a security relative to a market index when calculating residuals in the announcement period using the market model proposed by Sharpe (1964). This can be particularly troublesome for firms that trade less frequently than a market index. Brown and Warner (1980) demonstrate that the efficacy of the mean-adjusted-returns approach in detecting abnormal performance is no less than that of the market and risk-adjusted-return approach.

<sup>16</sup> The volume metrics adopted in this paper are conceptually similar to the price variability measure used in McNichol and Manegold (1983). They are all mean-adjusted measures. Similar to the case with price variability measures, mean-adjusted volume metrics, instead of risk-adjusted metrics, are used to avoid the errors-in-variables problem that may arise from nonsynchronous measurement of trading volume relative to a volume index when calculating residuals in the announcement period using the market model (Beaver 1968). However, the definition of relative trading volume is consistent with Beaver's (1968, p. 73) definition of his volume metric.

### **3.2.1 Price Variability Metrics**

Cumulative variance of returns metrics are computed as follows:

#### **Patell's (1976) CVR**

$$\text{Patell's } CVR_{i,L} = 1/L \sum_{K=1}^L \{ [u_{i,k}^2 (T_i - 4)] / [S_i^2 C_{i,k} (T_i - 2)] \}$$

<1>

$u_{i,k} = R_{i,k} - (\alpha_i + \beta_i R_{M,k})$  where  $R_{i,k}$  is the daily stock return for firm  $i$  on day  $k$ , and  $R_{M,k}$  is the return on an equally weighted market portfolio for day  $k$ . The model's parameters,  $\alpha_i$  and  $\beta_i$ , are derived from firm-specific regressions using past returns, where the estimation period extends from day  $\{-130\}$  to day  $\{-11\}$  (i.e., 120 daily returns), and day  $\{0\}$  is the filing date of Form 10-Q.  $S_i$  is the standard deviation of the residuals during the estimation period.  $C_{i,k}$  is the increase in the variance due to prediction outside the estimation period (see Patell 1976). The market model is estimated separately for each year of every firm.

#### **Beaver's (1968) CVR**

$$\text{Beaver's } CVR_{i,L} = 1/L \sum_{K=1}^L (u_{i,k}^2 / S_i^2)$$

<2>

$u_{i,k} = R_{i,k} - (\alpha_i + \beta_i R_{M,k})$  where  $R_{i,k}$  is the daily stock return for firm  $i$  on day  $k$ , and  $R_{M,k}$  is the return for an equally weighted market portfolio for day  $k$ . The model's parameters,  $\alpha_i$  and  $\beta_i$ , are derived from firm-specific regressions using past returns, where the estimation period extends from day  $\{-130\}$  to day  $\{-11\}$  (i.e., 120 daily returns), and day  $\{0\}$  is the filing date of Form 10-Q.  $S_i$  is the standard deviation of the residuals during the estimation period. The market model is estimated separately for each year of every firm.

#### **McNichols and Manegold's (1983) CVR**

L

$$\text{Mean-Adjusted CVR}_{i,L} = 1/L \sum_{K=1}^L (u_{i,k}^2 / S_i^2)$$

<3>

where

$$u_{i,k} = R_{i,k} - M_i;$$

$u_{i,k}$  = the announcement-period abnormal returns or prediction errors;

$S_i$  = the standard deviation of the returns during the estimation period; and

$M_i$  = the mean return during the estimation period.

### **3.2.2 Volume Analysis**

Holthausen and Verrecchia (1990) observe that the variance of security price is a more informative characterization than the mean of security price for measuring informedness and consensus because price effects can be positive or negative. However, trading volume results from the absolute value of net demand. Therefore, expected trading volume, instead of the variance of trading volume, is sufficient for understanding how it behaves when informedness and consensus shift.

Since both trading volume and trading volume variability measure abnormal levels of investor reaction to an accounting information signal, we conduct our analyses using both metrics to enhance the generalizability of trading volume results.

### **CAVOL**

A cumulative abnormal volume metric (CAVOL) is computed as follows

$$\text{CAVOL}_{i,L} = 1/L \sum_{K=1}^L \text{MADJVOL}_{i,k}$$

<4>

where

$$\text{MADJVOL}_{i,k} = V_{i,k} - \text{MVOL}_i;$$

MADJVOL<sub>i,k</sub> = the announcement-period mean-adjusted relative volume;

V<sub>i,k</sub> = relative volume or trading volume / shares outstanding, for firm i in day k;

and

MVOL<sub>i</sub> = the mean relative volume during the estimation period.

The estimation period extends from day {-130} to day {-11} (i.e., 120 daily volumes), and day {0} is the filing date of Form 10-Q.

### **CVRVOL**

A cumulative variance of volume metric (CVRVOL), similar to a mean-adjusted CVR, is computed as follows:

$$CVRVOL_{i,L} = 1/L \sum_{K=1}^L (vol_{i,k}^2 / SVOL_i^2)$$

<5>

K=1

where

vol<sub>i,k</sub> = V<sub>i,k</sub> - MVOL<sub>i</sub>;

V<sub>i,k</sub> = relative volume or trading volume / shares outstanding, for firm i in day k;

vol<sub>i,k</sub> = the announcement-period abnormal relative volume;

SVOL<sub>i</sub> = the standard deviation of relative volume during the estimation period;

and

MVOL<sub>i</sub> = the mean relative volume during the estimation period.

The estimation period extends from day {-130} to day {-11} (i.e., 120 daily volume data), and day {0} is the filing date of Form 10-Q.

### **3.2.3 Multivariate Regression Model**

This section concerns the following pooled time-series, cross-sectional multiple regression model based on Griffin (2003):

$$CVR_{i,t} = \beta_0 + \beta_1 IN_{i,t} + \beta_2 QDUM_{i,t} + \beta_3 WK_{i,t} + \beta_4 MC_{i,t} + \beta_5 AA_{i,t} + \varepsilon_{i,t} \quad <6>$$

The dependent variable,  $CVR_{i,t}$ , is either Patell's cumulative variance of returns or mean-adjusted cumulative variance of returns measured over the investor response period for firm  $i$  at a short event window  $t$ , namely, over three (-1 to +1) or five (-2 to +2) days centering on the Form 10-Q filing date (day 0).<sup>17</sup> As in Griffin (2003), the independent variables are 0-1 indicator variables defined as follows: Information Intensity,  $IN_{i,t}$ , takes 1 when 100 or more form 10-Q filings per day and 0 otherwise; The quarterly dummy variable (QDUM) takes 1 if the quarter is the second quarter following SOX and 0 if the quarter is the one right before SOX; midweek filing,  $WK_{i,t}$ , takes 1 if the day is either Mon or Fri and 0 otherwise; market capitalization,  $MC_{i,t}$ , takes 1 if it is greater than median in the quarter and 0 if it is less than median; and accounting accruals,  $AA_{i,t}$ , measured as net income from continuing operations less operating cash flow deflated by shareholders' equity, takes 1 if greater than median in the quarter and 0 if less than median.<sup>18</sup>

The sign of the information intensity variable (IN) is expected to be positive due to industry effects around the filing date when high frequency (e.g., more than 100 per day) of filing takes place. The sign of the quarterly dummy variable (QDUM) is expected to be negative for high-tech firms if this paper's first hypothesis that stock price variability is lower for high-tech

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<sup>17</sup> Asthana and Balsam (2001) reported a significant investor response to an EDGAR filing prior to the actual filing date. They used a five-day event window (-1, 3). Griffin (2003) found that the strongest average response is generally on day 0 and day 1, which is precisely when one would expect it assuming no leakage or violation of EDGAR filing procedures.

<sup>18</sup> According to Griffin (2003), there are three more information environment variables that could affect unexpected stock price response at the announcement of 10-K or 10-Q reports, but were excluded in this study: Form NT filing (NT), Industry Composition (IC), and Institutional Holdings (IH). There were no NT filings (i.e., the form 10-Q filing made after the due date which is 45<sup>th</sup> date from the fiscal quarter end) observed in both high-tech and low-tech samples. There were no changes in the composition and the number of firms for both high-tech and low-tech firms during the sample period. Quarterly data for institutional holdings are not available in the industrial quarterly COMPUSTAT database.

firms in the post-SOX period than in the pre-SOX period during quarterly reporting is sustainable. The sign of the midweek filing variable is predicted to be positive because the information arrives more as a surprise if filings are made at the beginning or end of a week (Gibbons and Hess, 1981; Griffin, 2003). Prior research such as Atiase (1985), Bamber (1987), Freeman (1987), and others has documented that smaller firms respond more strongly than larger firms at earnings announcement. Accordingly, the expected sign of the market capitalization variable (MC) is negative. As Griffin (2003) argues, investors might respond more strongly to firms with extreme accruals. Therefore, we predict a positive sign for the accounting accruals variable (AA).

#### ***3.2.4 Conservatism as continuous recognition of more bad news than good news***

Givoly and Hayn (2000) recognize that conservatism directly affects the magnitude of earnings.<sup>19</sup> Following Stickney and Weil (2000, 875), they define conservatism as “a selection of accounting principles that lead to the minimization of cumulative reported earnings.” In a steady state, the cumulative amount of net income is expected to converge in the long run to cash flow from operations. If cumulative accruals, as the aggregate difference between net income and cash flows over time do not sum to zero and are negative, it indicates that aggregate cumulative net income is consistently lower than the aggregate cumulative cash flow from operations, an indication of conservatism. Cumulative rather than yearly accruals are used to measure conservatism because of the nature of accruals: periods in which net income exceeds (falls below) cash flows from operations are expected to be followed by periods with negative (positive) accruals.

Total accruals consist of operating (working capital) accruals and non-operating accruals. Operating accruals arise from the basic day-to-day

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<sup>19</sup> Since there has not been a consensus on the definition of conservatism in accounting literature, multiple measures of conservatism can be used. Lobo and Zhou (2006) used the Basu (1997) measure of conservatism and

business of a firm, including changes in accounts receivables, inventory, prepaid expenses, accounts payables, and tax payables. Non-operating accruals, on the other hand, include items such as loss and bad debt provisions, restructuring charges, the effect of changes in estimates, gains and losses on the sale of assets, asset write-downs, the accrual and capitalization of expenses and the deferral of revenues and their subsequent recognition (Givoly and Hayn 2000). Items included in non-operating accruals are largely subject to management discretion and, thus, a more accurate measure for conservatism.

Consistent with Givoly and Hayn (2000), non-operating accruals are calculated as follow:

$$\text{Total accruals (before depreciation)} = (\text{net income} + \text{depreciation}) - \text{cash flow from operations}$$

$$\text{Operating accruals} = \Delta\text{Accounts Receivable} + \Delta\text{Inventories} + \Delta\text{Prepaid Expenses} - \Delta\text{Accounts Payable} - \Delta\text{Tax Payable}$$

$$\text{Non-operating accruals} = \text{Total accruals (before depreciation)} - \text{operating accruals} \quad <7>$$

A direct comparison of the magnitude of the cumulative accruals is not appropriate because of the difference in size between high-tech and low-tech firms.<sup>20</sup> We thus deflate accruals alternatively by assets and sales. If conservative accounting practices tend to minimize accounting earnings, then conservative firms would be more likely to have higher levels of

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discretionary accruals. The non-operating accruals measure of conservatism was adopted by Givoly and Hayn (2000), and Kwon, Yin, and Han (2006).

<sup>20</sup> Kwon, Yin, and Han (2006) report that the average total assets and sales of LTC are approximately four times greater than those for HTC in the 1990s. The average total assets (sales) of LTC is \$3,706.88 million (\$3,269.5 million), compared with \$926.9 million (\$844.59 million) for HTC.

negative (or lower levels of positive) cumulative non-operating accruals over time than other firms.

### 3.2.5 Discretionary Accruals

#### **Modified Jones Model**

We compute discretionary accruals using the cross-sectional modified Jones model estimated by industry and year. The cross-sectional approach has the advantage of controlling for the effects of industry-wide economic changes on total accruals and allowing the coefficients to change across years due to possible structural changes.<sup>21</sup> For every year  $t$  from 1998 to 2004, the following model is estimated:

$$TACCR_{i,t} / A_{i,t-1} = a_t (1/A_{i,t-1}) + b_{1t} (\Delta REV_{i,t} - \Delta REC_{i,t}) / A_{i,t-1} + b_{2t} (PPE_{i,t} / A_{i,t-1}) + \epsilon_{i,t} \quad <8>$$

where, for firm  $i$  at time  $t$ ,

$TACCR_{i,t}$  = total accruals, see footnote<sup>22</sup>;

$A_{i,t-1}$  = lagged total assets (item #6);

$\Delta REV_{i,t}$  = change in sales (item #12);

$\Delta REC_{i,t}$  = change in accounts receivable (item #2);

$PPE_{i,t}$  = gross property, plant and equipment (item #7); and

$\epsilon_{i,t}$  = error term.

Discretionary accruals are estimated as the difference between reported total accruals and fitted values of total accruals (nondiscretionary accruals) using coefficient estimates from equation (8) for the years 1998-2004:

<sup>21</sup> Guay, Kothari, and Watts [1996] investigate the relative merit of various discretionary accrual models and conclude that the cross-sectional Jones and cross-sectional modified Jones models are most the effective in identifying discretionary accruals. DeFond and Jiambalvo [1994], Subramanyam [1996], Bartov, Gul, and Tsui [2000], and Gul, Leung, and Srinidhi [2000] further support the adoption of the cross-sectional modified Jones model.

<sup>22</sup>  $TACCR_{i,t} = \Delta CA_{i,t} - \Delta CL_{i,t} - \Delta Cash_{i,t} + \Delta STD_{i,t} - Dep_{i,t}$ , where, for firm  $i$  at time  $t$ ,  $\Delta CA_{i,t}$  = change in current assets (item #4);  $\Delta CL_{i,t}$  = change in current liabilities (item #5);  $\Delta Cash_{i,t}$  = change in cash and cash equivalents (item #1);  $\Delta STD_{i,t}$  = change in debt included in current liabilities (item #34); and  $Dep_{i,t}$  = depreciation and amortization expense (item #14).

$$DA_{i,t} = TACCR_{i,t}/A_{i,t-1} - [a_t (1/A_{i,t-1}) + b_{1t} (\Delta REV_{i,t} - \Delta REC_{i,t}) / A_{i,t-1} + b_{2t} (PPE_{i,t} / A_{i,t-1})] \quad <9>$$

where  $DA_{i,t}$  is discretionary accruals and  $\Delta REC_{i,t}$  is the change in accounts receivable (item #2).

### **Performance-Matched Discretionary Accruals**

We adjust discretionary accruals for performance and industry effects as suggested in Kothari, Leone, and Wasley (2005) because potential measurement errors in discretionary accruals may correlate with industry membership, growth, or performance. We calculate performance-matched discretionary accruals for firm  $i$  as discretionary accruals of firm  $i$  minus discretionary accruals of firm  $j$  that exhibits the closest ROA in the same industry.

### **3.2.6 Basu's Conservatism Metric**

To gain further evidence on the change in conservatism for our sample firms pre-and post-SOX, we use the Basu (1997) measure to investigate how firms incorporate good news and bad news into earnings. We reckon that conservatism has increased if firms incorporate bad news even faster or good news even slower post-SOX. We test this hypothesis both within each high-tech and low-tech sample and also between them by the following regression model:

$$\begin{aligned} \text{Earnings} = & \alpha_0 + \alpha_1 * \text{Post}_{it} + \alpha_2 * \text{LTC}_{it} + \alpha_3 * \text{LTC}_{it} * \text{Post}_{it} \\ & + \beta_0 * \text{D}_{it} + \beta_1 * \text{Post}_{it} * \text{D}_{it} + \beta_2 * \text{LTC}_{it} * \text{D}_{it} + \beta_3 * \text{LTC}_{it} * \text{Post}_{it} * \text{D}_{it} \\ & + \\ & \gamma_0 * \text{Return}_{it} + \gamma_1 * \text{Post}_{it} * \text{Return}_{it} + \gamma_2 * \text{LTC}_{it} * \text{Return}_{it} + \gamma_3 * \text{LTC}_{it} * \text{Post}_{it} * \text{Return}_{it} \\ & + \phi_0 * \text{D}_{it} * \text{Return}_{it} + \phi_1 * \text{Post}_{it} * \text{D}_{it} * \text{Return}_{it} + \phi_2 * \text{LTC}_{it} * \text{D}_{it} * \text{Return}_{it} + \phi_3 * \text{LTC}_{it} * \text{Post}_{it} * \text{D}_{it} * \text{Return}_{it} + \varepsilon_{it} \end{aligned} \quad <10>$$

where, for firm  $i$  at time  $t$

Post = 1 if the observation is after 2002 and 0 if it is before 2002

D=1 if stock return is negative and 0 otherwise

Return = 12 month stock return for fiscal year

LTC =1 if the firm is a low-tech firm and 0 otherwise

To investigate whether high-tech firms' rate of incorporating bad news into earnings is *faster* post-SOX, the coefficient of interest is  $\gamma_1 + \phi_1$  (Post\*Return + Post\*D\*Return) and is expected to be positive; to investigate whether the change in rate of incorporating good news into earnings is *slower* post-SOX, the coefficient of interest is  $\gamma_1$  and is expected to be negative. For low-tech firms, to examine whether the rate of incorporating bad news into earnings is *faster* post-SOX, the coefficient of interest is  $\gamma_1 + \gamma_3 + \phi_1 + \phi_3$  (Post\*Return + LT\*Post\*Return + Post\*D\*Return + LT\*Post\*Return\*D) and is expected to be positive; to examine the change in rate of incorporating good news into earnings is *slower* post-SOX, the coefficient of interest is  $\gamma_1 + \gamma_3$  (Post\*Return + LT\*Post\*Return) and is expected to be negative. Finally, to investigate post-SOX whether high-tech firms' *change* of rate of incorporating bad news into earnings is larger than low-tech firms, the coefficient of interest is  $\gamma_3 + \phi_3$  (LT\*Post\*Return + LT\*Post\*Return\*D) and is expected to be negative; and for the good news test, the coefficient of interest is  $\gamma_3$  (LT\*Post\*Return) and is expected to be positive.

## 4. Empirical Results

### 4.1 Informedness and Consensus Analysis

In Table 4, we examine whether informedness and consensus have changed post-SOX. Three different price variability metrics from prior studies – Patell's CVR, Beaver's CVR, and Mean-Adjusted CVR - are adopted to measure the information content of SOX disclosures. The information

content is proxied by abnormal stock return variances and abnormal trading volume as in Beaver (1968).

The analyses based upon comparisons of CVRs three years prior to and following the enactment of the SOX would suffer potential confounding event problems arising from required disclosures under other statements of financial accounting standards such as SFAS 138-150.<sup>23</sup> Therefore, we examine the information content issue more closely using quarterly data in Table 4. We compare stock return variances at the announcement date of a quarterly report that is issued in the last quarter prior to the SOX enactment date (July 30, 2002) with stock return variances at the announcement date of a quarterly report that is issued in the second quarter following the Act.<sup>24</sup>

### **Univariate Analysis**

As shown in Panels A & B of Table 4, stock return variances for high-tech firms decreased very significantly in the post-SOX period. The comparisons of all measures of price variability reveal 1% significance levels in both parametric and non-parametric tests. The results of Panels A & B in Table 3 strongly suggest that stock price variability is lower for high-tech firms during the disclosure of accounting information after the Sarbanes-Oxley Act, supporting H1.

Panel C of Table 4 indirectly tests whether or not the forecast consensus of market agents improved after SOX. The annual earnings forecast dispersion measured at the first fiscal-year-end month after SOX is compared with that measured at the last fiscal-year-end month before SOX.

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<sup>23</sup> The following significant statements of financial accounting standards (SFASs) were issued during the sample period: SFAS 138 (Accounting for Certain Derivative Instruments and Certain Hedging Activities, June 2000); SFAS 140: Accounting for Transfers and Servicing of Financial Assets and Extinguishments of Liabilities, September 2000); SFAS 141 (Business Combinations, June 2001),; SFAS 142 (Goodwill and Other Intangible Assets, June 2001); SFAS 143 (Accounting for Asset Retirement Obligations, June 2001); SFAS 144 (Accounting for the Impairment of Disposal of Long-Lived Assets, August 2001); SFAS 146 (Accounting for Costs Associated with Exit or Disposal Activities, June 2002); SFAS 148 (Accounting for Stock-Based Compensation – Transaction and Disclosure, December 2002); SFAS 149 (Amendment of Statement 133 on Derivative Instruments and Hedging Activities, April 2003); and SFAS 150 (Accounting for Certain Financial Instruments with Characteristics of both Liabilities and Equity, May 2003).

<sup>24</sup> Normally, firms started to report internal control related disclosures in the second quarterly report after SOX enactment date.

Monthly forecast data in measuring forecast dispersion are used due to limited or unavailable daily forecast data. The results of Panel C show some evidence of decreased forecast dispersion for both high-tech and low-tech firms in the post-SOX period. In other words, security analysts' forecast consensus increased following the Act. Specifically, matched-pair student's t-statistics are 1.66 (1.85) for high-tech (low-tech) firms, which are significant at 10% levels in two-tailed tests. There is a caveat, however, in relating the above evidence of an increase in analysts' consensus of annual earnings forecasts to the Holthausen and Verrecchia's (1990) consensus effect at the time of accounting disclosure. The former compares analysts' earnings forecast consensus between preselected pre- and post-SOX periods before the actual earnings announcement is made. In contrast to analysts' earnings forecast consensus, the latter focuses on investors' consensus of opinions and actions at the time of accounting disclosure (Form 10-Q). To the extent that the earnings number can fully reflect informativeness of accounting disclosure in both pre-SOX and post-SOX periods, and financial analysts can fairly represent general investors' opinions, those two consensus concepts (ex ante and ex post) may converge on the same effect.

[Insert Table 4 about here]

Figure 2 shows graphic presentations of the data related to Patell's, Beaver's and Mean-Adjusted CVRs for both Pre- and Post-SOX quarters, which are tabulated in Panel A (Three-Day Window) of Table 4. Indeed, a significant decrease in stock return variability for high-tech firms relative to low-tech firms is clearly demonstrated for both mean and median price variability cases.

[Insert Figure 2 about here]

The analyses of trading volume and trading volume variability reported in Tables 5&6 reveal evidence of decreased abnormal trading volume at the announcement of second quarterly reports after the enactment of SOX for both high-tech and low-tech firms. First, the results of trading volume in Table 5 show that in low-tech industries, the matched-pair student's t (non-

parametric Wilcoxon Z) statistic for a three-day event window is 1.99 (2.84), which is statistically significant at 5% (1%) levels in two-tailed tests. For high-tech industries, non-parametric Wilcoxon Z statistic is 2.26 (2.59) for a three-day (five-day) window, which is significant at 5% (1%) levels in two-tailed tests. Second, the evidence of decreased abnormal trading volume variability in Table 6 also is qualitatively consistent with that revealed in Table 5. Specifically, in low-tech industries, the matched-pair student's t statistic for a three-day (five-day) event window is 2.11 (1.98), which is statistically significant at 5% (10%) levels in two-tailed tests. For high-tech industries, the non-parametric Wilcoxon Z statistic is 1.52 (2.12) for a three-day (five-day) window, which is significant at the 5% (1%) level in one-tailed (two-tailed) tests. The results of Tables 5 & 6 are overall consistent with the prediction that trading volume is lower for both high-tech and low-tech firms during the disclosure of accounting information after the Sarbanes-Oxley Act, supporting H2.

[Insert Tables 5 & 6 about here]

### **Multi-variate Analysis**

The results demonstrated in Tables 7 and 8 are based on multivariate analyses to test for whether a significant decrease in stock return variability in the post-SOX quarter for high-tech firms vis-à-vis low-tech firms, documented in Table 4, can be affected by other information environment variables such as information intensity, midweek filing, market capitalization, and the amount of accounting accruals. As shown in Table 7, this paper's first hypothesis that stock price variability is lower for high-tech firms in the post-SOX period than in the pre-SOX period during quarterly reporting has still been supported by the presence of strong negative coefficients for the quarterly dummy variable (QDUM), which are in general significant at 1% and higher levels in two-tailed tests for the high-tech sector (Table 7), but the QDUM coefficients are insignificant for the low-tech sector (Table 8) when two different metrics of the stock price variability (i.e., Patell's CVR

and Mean-Adjusted CVR) are adopted.<sup>25</sup>

[Insert Tables 7 & 8 about here]

The results in price variability, volume, and analysts' forecast dispersion tests together suggest that the effect of informedness dominates the effect of consensus for high-tech firms. But the effects of both informedness and consensus cancel out each other for low-tech firms.

## **4.2 Tests of Conservatism**

In this subsection, we report results on the change in conservatism of high-tech and low-tech firms. In the first measure of conservatism, firms with more negative accruals are said to be more conservative; in the second measure, we use the Basu (1997) conservatism metric to determine if it has changed before and after SOX for the two samples.

### ***4.2.1 Cumulative Non-operating Accruals and Performance-Matched Discretionary Accruals***

The test results from the use of two accrual proxies of conservatism – Cumulative Non-operating Accruals (CNA) and Performance-Matched Discretionary Accruals (PMDA) are reported in Table 9. Specifically, Panel A shows that cumulative non-operating accruals (CNA) are negative across pre- and post-SOX periods. In general, both high-tech and low-tech firms demonstrate more negative numbers of cumulative non-operating accruals in the post-SOX period. High-tech firms show some evidence of heightened conservatism measured by cumulative non-operating accruals. The difference between pre-SOX and post-SOX periods is statistically significant at the 10% level in two-tailed tests only under parametric tests when deflated by net sales. Low-tech firms do not reveal any significant shift in conservatism in the post-SOX period.

The results of Panel B in Table 9 also reveal that high-tech firms demonstrate more negative (conservative) numbers of performance-matched discretionary accruals in the post-SOX period vis-à-vis the pre-SOX

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<sup>25</sup> The results based on Beaver's CVR were qualitatively the same as those reported.

period than low-tech firms. The difference between pre-SOX and post-SOX periods is statistically significant at the 1% (10%) level in two-tailed (one-tailed) tests under parametric (non-parametric) tests for high-tech firms. Low-tech firms reveal some weak shift in conservatism in the post-SOX period only under non-parametric tests in one-tailed tests at the 10% level.

In summary, the results of Table 9 reflect support for this paper's third hypothesis that the level of accounting conservatism is higher for high-tech firms during the disclosure of accounting information after the Sarbanes-Oxley Act. The evidence of increased levels of conservatism in financial reporting following SOX and the resulting requirement by the SEC that financial statements be certified by CEOs and CFOs is also consistent with the results of Lobo and Zhou (2006), at least for the high-tech sector.

[Insert Table 9 about here]

In Table 10, high-tech and low-tech firms are compared in both Cumulative Non-operating Accruals (CNA) and Performance-Matched Discretionary Accruals (PMDA), two proxies of conservatism. The results of Panel A demonstrate that cumulative non-operating accruals (CNA) are more negative for HTC than for LTC across pre- and post-SOX periods. More specifically, the table compares means and medians of cumulative non-operating accruals between the two groups in the pre-SOX period and the post-SOX period. In the pre-SOX period, the mean (median) of non-operating accruals deflated by net sales is  $-0.239$  ( $-0.024$ ) for HT, compared to  $-0.014$  ( $-0.012$ ) for LT. Results show that cumulative non-operating accruals are lower for HT than for LT, and t-tests and Wilcoxon tests indicate that the differences are significant at the 1% level when net sales are used as the deflator.<sup>26</sup>

In the post-SOX period, the mean (median) of non-operating accruals deflated by net sales is  $-1.672$  ( $-0.028$ ) for HT, and  $-0.023$  ( $-0.014$ ) for LT. Results show that cumulative non-operating accruals are also lower for HT

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<sup>26</sup> The results in Panel A are consistent with those documented in Kwon, Yin, and Han (2006). The results were qualitatively similar when assets were used as the deflator.

than for LT, and t-tests and Wilcoxon tests indicate that the differences are significant, on average, at 5% levels.

Panel B of Table 10 presents the results for the differences between high-tech and low-tech firms in performance-matched discretionary accruals. In both 1998-2000 and 2002-2004 sample periods, high-tech firms adopted more income-decreasing (conservative) accounting methods than low-tech firms in financial reporting. In general, their differences are significant at the 1% (10%) level under the parametric (non-parametric) tests. The evidence of greater use of income-decreasing methods for high-tech firms is consistent with the results of Kwon, Yin, and Han (2006).<sup>27</sup> The empirical results shown in Table 10 strongly suggest that the financial reporting of high-tech firms is more conservative than that of low-tech firms after the Sarbanes-Oxley Act. This evidence of high-tech firms' higher levels of conservatism may explain a significant decrease in informedness that dominated an increase in consensus during the disclosure of accounting information after the Sarbanes-Oxley Act.

[Insert Table 10 about here]

#### **4.2.2 Basu's Conservatism Metric**

Panel A of Table 11 presents regression results on Basu's conservatism metric and panel B presents the test statistics on the coefficients of interests. For bad news, we do not find any change in the speed of how it is incorporated into earnings for both high-tech and low-tech firms. The coefficients  $\gamma_1 + \phi_1$  and  $\gamma_1 + \gamma_3 + \phi_1 + \phi_3$  are both insignificant. However, the rate of incorporating good news into earnings is significantly slower for high-tech firms post-SOX. The coefficient  $\gamma_1$  is negative and significant at 1%. For low-

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<sup>27</sup> Kwon, Yin and Han (2006) present possible explanations for greater use of income-decreasing methods in high-tech industries. Those can be summarized as follows: (1) the threat of shareholder litigation increases high-tech managers' incentives to practice conservative accounting; (2) high-tech firms that publicly commit to conservative accounting choices convey credible and favorable private information about future cash flow by signaling that they have the ability to meet investors' expectations about future growth and therefore they have an incentive to engage in conservative reporting; and (3) high-tech firms attract more attention from financial analysts and the investment community than low-tech firms because of their enormous opportunities for growth and favored status in the technology-based New Economy. As a result, high-tech firms undergo closer scrutiny by financial analysts as

tech firms, there is still no change in the rate of good news being incorporated into earnings as  $\gamma_1 + \gamma_3$  is insignificant. Comparing between high-tech and low-tech firms, the rate of change for good news is much larger than for low-tech firms as indicated in the positive and significant coefficient of  $\gamma_3$ . The results shown in Table 11 are therefore consistent with the accruals analysis that high-tech firms exhibit higher levels of conservatism than low-tech firms post-SOX.

[Insert Table 11 about here]

#### **4.2.3 Interpretation of the empirical results**

Consistent with theoretical predictions provided by Holthausen and Verrecchia (1990), our empirical results reveal that trading volume decreased for both high-tech and low-tech firms. The significant decrease in stock return variability for high-tech firms following the Act indicate that decreases in the informedness of post-SOX disclosures more than compensate for increases in the market agents' consensus views of the disclosures. Also, the insignificant decrease in stock return variability for low-tech firms following the Act shows that decreases in the informedness of post-SOX disclosures equally compensate for increases in the market agents' consensus views of the disclosures. In both cases, the common noise ( $n$ ) component in the information signal received by the market agents at the time of an announcement of a quarterly report following the Act very likely increased due to the common challenge – new accounting/auditing rules under the SOX. This change in informedness is likely to be caused by more conservative accounting adopted by high-tech firms.

### **5. Concluding remarks**

We examine systematic differences between pre-SOX and post-SOX periods for high-tech firms vis-à-vis low-tech firms in stock return variability and trading volume behavior. The results extend prior literature on the relation between information disclosures and their effect on information

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objects of investment recommendations to their customers and are likely to be more prudent in their financial reporting.

content proxies. Further, the impact of SOX differs by industry participation, i.e., high-tech versus low-tech.

Our paper is subject to two caveats. First our interpretation is based on the assumption that SOX promotes reliability more than relevance of accounting information and thus decrease in informedness is a result of higher reliability at the expense of lower relevance. And second, the soundness of our interpretation hinges on the validity of the informedness and consensus proxies.

The overall results indicate that firms with higher litigation costs are likely to be affected by SOX more than firms with lower litigation costs. Information content in accounting reports has decreased significantly for high-tech firms when compared with low-tech firms. One interpretation is that high-tech firms become more conservative in their accounting relative to low-tech firms. Such an increase in conservatism likely improves the credibility of accounting information, thereby increasing consensus among agents. According to Holthausen and Verrecchia (1990), an increase in consensus is a result of an increase in market agents' common noise in information signals, which in our case is the accounting information disclosed in quarterly reports following SOX. An increase in the variance of common noise is reflected in the decrease in trading volume or its variability. Based on both univariate and multivariate analyses, we find evidence consistent with this prediction. Significantly lower levels of stock return variability and trading volume for high-tech firms following the Act may reveal the fact that the informedness effect dominates the consensus effect. High-tech firms may have attempted to satisfy higher standards of information reliability required under the SOX at the expense of the relevance of voluntary information disclosure.

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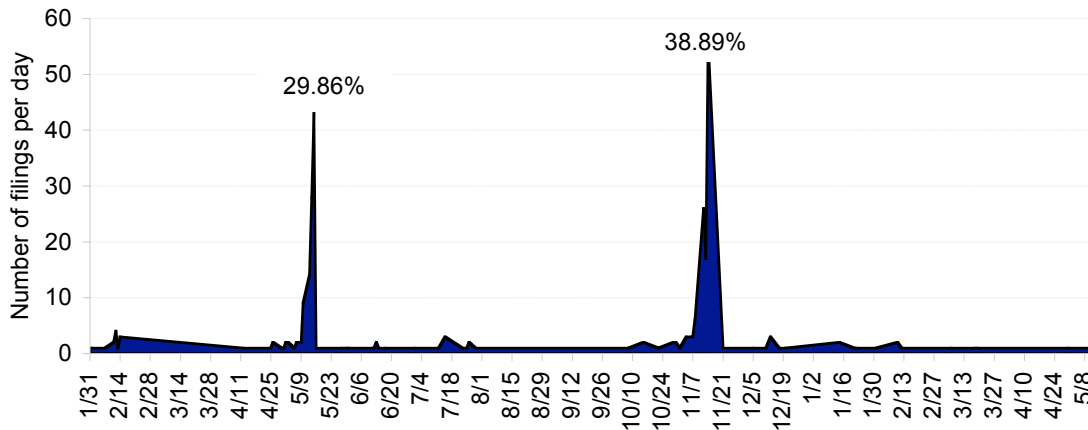
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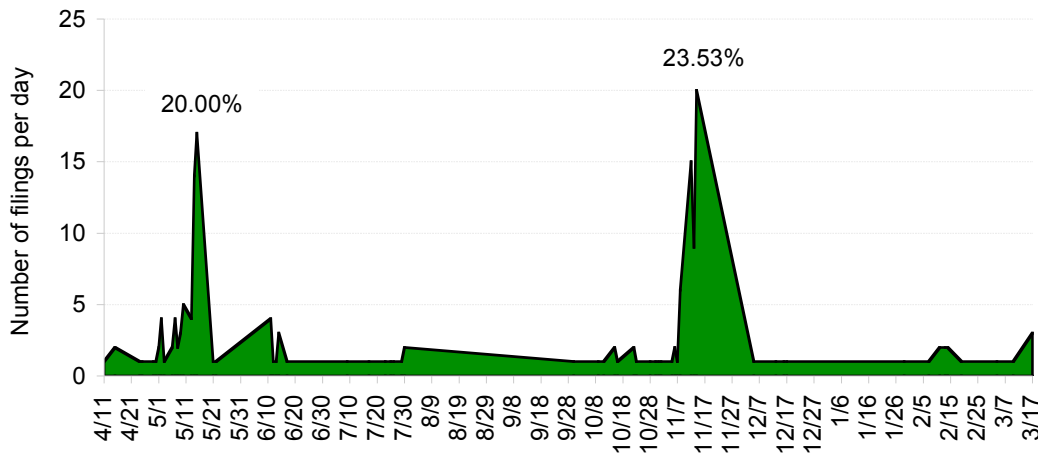
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**Figure 1A. Distribution of Form 10-Q Filings Per Day for High-Tech Firms**



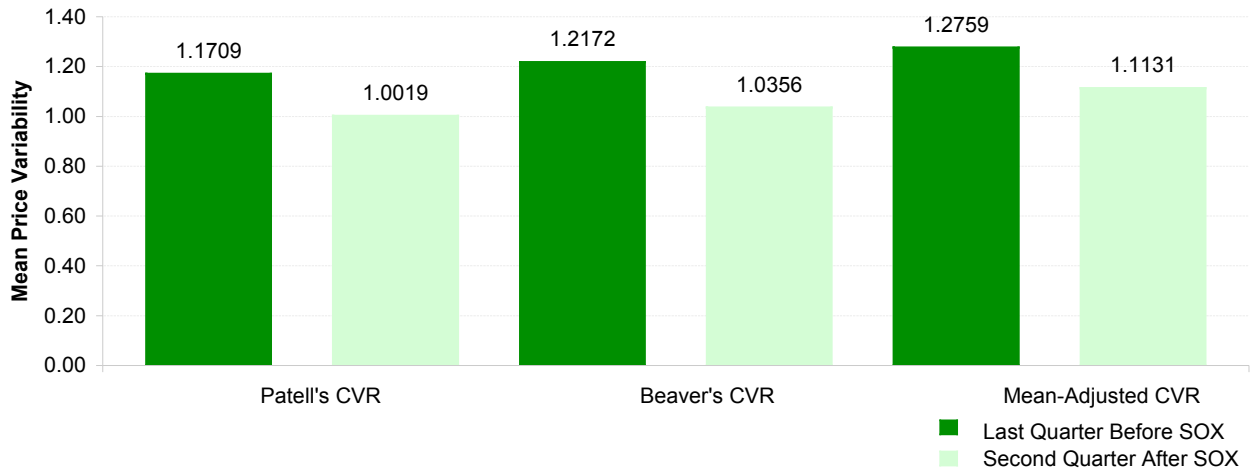
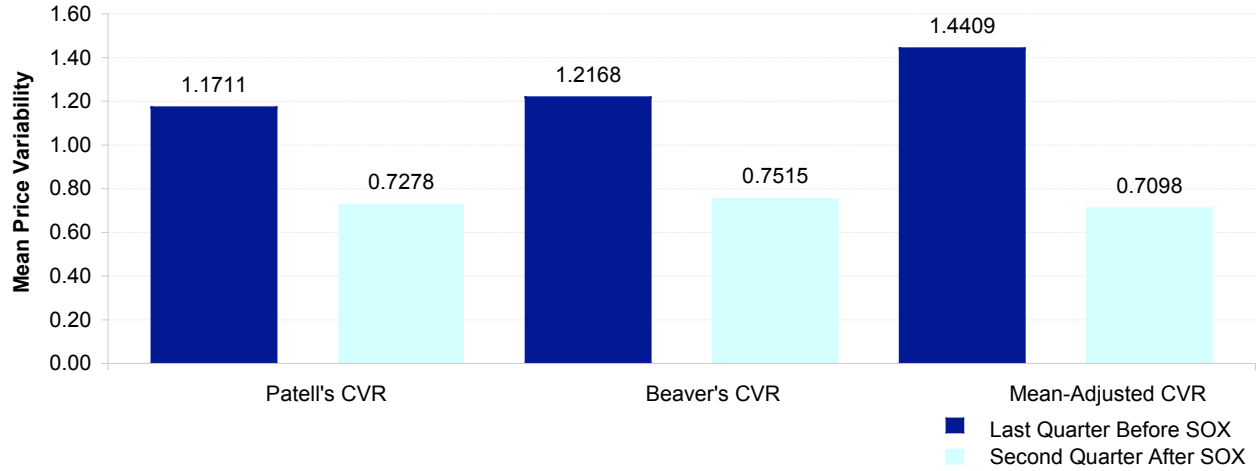
**Figure 1B. Distribution of Form 10-Q Filings Per Day for Low-Tech Firms**



**Figure 2. Comparison of Mean and Median Price Variability between Pre- and Post- SOX<sup>28</sup>**

**Panel A: Mean Price Variability**

**HT Firms**

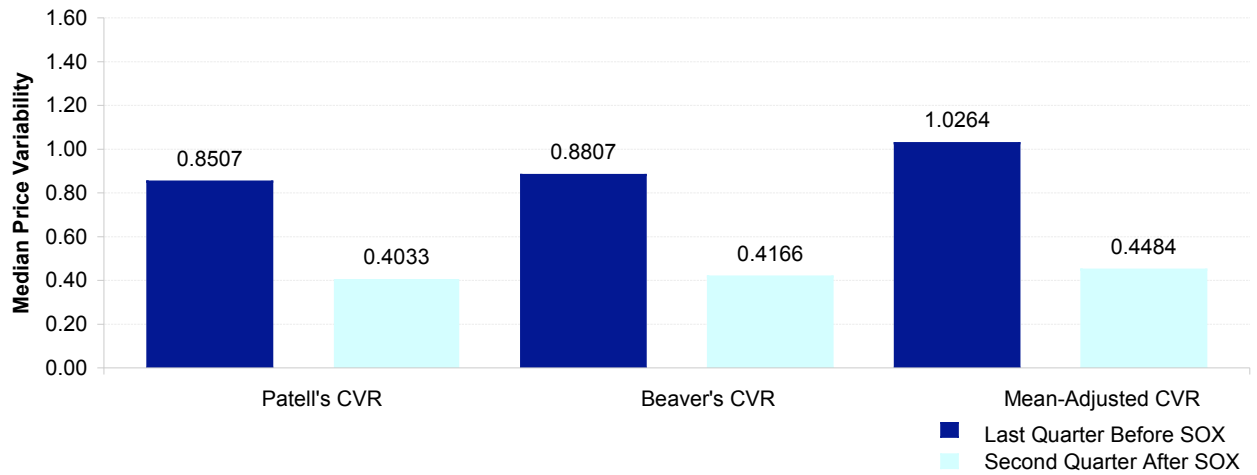


<sup>28</sup> Applied to three-day event window

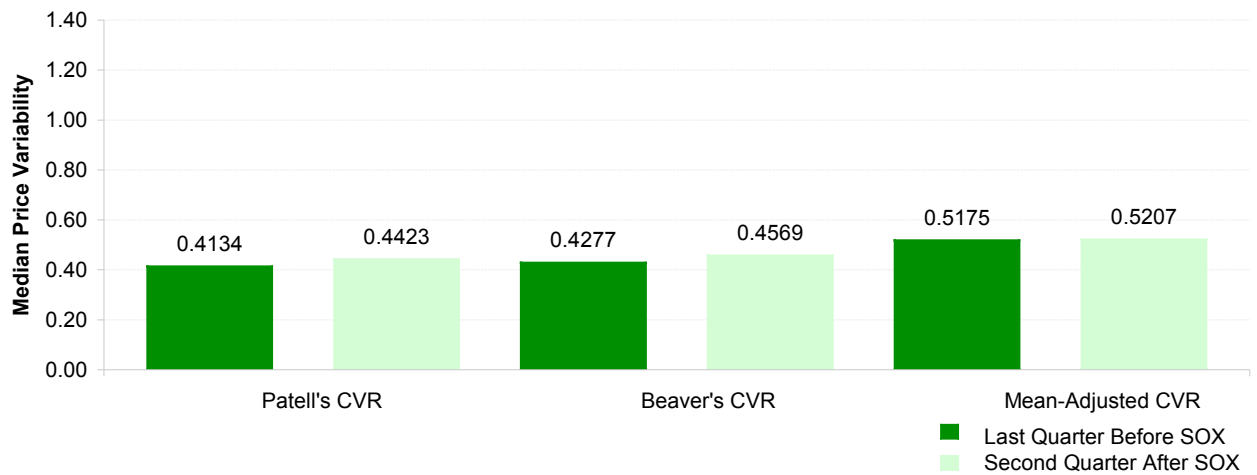
Figure 2 (Continued)

Panel B: Median Price Variability

HT Firms



LT Firms



**TABLE 1-A**  
**High-tech (HT) and Low-tech (LT) Firms**

	HT [LT]					
	1998	1999	2000	2002	2003	2004
Francis and Schipper's (1999) classification of high-(low-) tech firms	2706 [984]	2706 [984]	2706[984]	2706[984]	2706[984]	2706[984]
<i>Add:</i> CNN tech firms not in FS	22	22	22	22	22	22
	2728 [984]	2728 [984]	2728[984]	2728[984]	2728[984]	2728[984]
<i>Deduct:</i> Missing Forecast data in the IBES file	2298 [758]	2331 [785]	2418[816]	2518[865]	2495[865]	2465 [863]
	430 [226]	397 [199]	310 [168]	210[119]	233[119]	263 [121]
<i>Deduct:</i> Missing Compustat Data, Missing 10-Q dates, and Other reduction of the number of Observations to achieve Equal Size across all years	312[184]	279 [157]	192[126]	92[77]	115[77]	145 [79]
Same Firms across all six fiscal years for matched comparison tests	118 [42]	118 [42]	118 [42]	118[42]	118[42]	118 [42]

**Stock Return Variability, Trading Volume, and Forecast Dispersion Tests: 144[85] firms**

**Conservatism Tests: 118 [42] firms (constant sample across 1998-2004)**

**Final Sample Firms which appear at least once during the period from 1998 to 2004: 365 [74] firms**

**TABLE 1-B**  
**Three-digit SIC Composition of High-tech and Low-tech Firms**

3-digit SIC	Industry	Number of firms	%
<b>Panel A: High-Tech Firms [HT]</b>			
283	Drugs	58	15.8
355	Special Industry Machinery	1	0.3
357	Computer and Office Equipment	48	13.2
360	Electronic & Other Electric Equipment	2	0.5
361	Electric Distribution Equipment	2	0.5
362	Electrical Industrial Apparatus	3	0.8
363	Household Appliances	2	0.5
364	Electric Lighting and Wiring Equipment	3	0.8
365	Household Audio and Video Equipment	3	0.8
366	Communications Equipment	35	9.6
367	Electronic Components and Accessories	66	18.1
369	Misc. Electrical Equipment & Supplies	5	1.4
381	Search and Navigation Equipment	1	0.3
382	Measuring and Controlling Devices	1	0.3
481	Telephone Communications	7	1.9
484	Cable and Other Pay TV Services	1	0.3
489	Communications Services, NEC	1	0.3
573	Radio, TV, & Electronic Stores	1	0.3
679	Miscellaneous Investing	1	0.3
737	Computer and Data Processing Services	120	32.9
873	Research and Testing Services	4	1.1
Total		365	100%
<b>Panel B: Low-Tech Firms (LT)</b>			
240	Lumber and Wood Products	2	2.7
243	Millwork, Plywood & Structural Members	1	1.4
245	Wood Buildings and Mobile Homes	1	1.4
260	Paper and Allied Products	2	2.7
262	Paper Mills	5	6.7
265	Paperboard Containers and Boxes	1	1.4
267	Misc. Converted Paper Products	3	4.1
301	Tires and Inner Tubes	2	2.7
302	Rubber and Plastics Footwear	3	4.0
305	Hose & Belting & Gaskets & Packing	1	1.4
306	Fabricated Rubber Products, NEC	1	1.4
308	Misc. Plastics Products	5	6.7
331	Blast Furnace and Basic Steel Products	4	5.4
356	General Industrial Machinery and Equip.	11	14.9
371	Motor Vehicles and Equipment	23	31.1
399	Misc. Manufacturing Industries	3	4.0
541	Grocery Stores	6	8.0
Total		74	100%

**TABLE 2**  
**Descriptive Statistics**  
**Constant Sample<sup>a</sup>**

Variable <sup>a</sup>	<u>1998-2000</u>		<u>2002-2004</u>		Matched-Pair Wilcoxon	
	Mean	Median	Mean	Median	Student's Signed-Rank t	Z
Size of Operation (SIZE)						
HT	0.9726	0.9880	0.8433	0.7285	4.57***	4.19***
LT	1.1771	0.9300	1.0839	0.8270	2.23**	3.17***
Research and Development Expenses deflated by Assets (RNDA)						
HT	0.0634	0.0520	0.0585	0.0450	1.53	1.74*
LT	0.0134	0.0050	0.0116	0.0030	1.23	1.34
Selling, General, and Administrative Expenses deflated by Net Sales (SGAS)						
HT	0.3144	0.2980	0.3415	0.3385	-3.23***	-2.39**
LT	0.1439	0.1080	0.1354	0.1060	2.04**	1.55
Special Items deflated by Net Sales (SPECS)						
HT	-0.0101	0.0000	-0.0201	-0.0020	1.48	1.03
LT	-0.0048	0.0000	-0.0044	0.0000	-0.22	0.36
Debt-to-Total Assets (DEBTA)						
HT	0.1524	0.1130	0.1328	0.1345	1.04	0.89
LT	0.3115	0.2370	0.2738	0.2560	1.12	0.10
Market-to-Book Value of Assets (MTBA)						
HT	5.1573	3.7370	2.4596	2.2505	5.55***	5.63***
LT	2.2789	1.9970	1.9698	1.5290	2.23**	2.64***
Number of Analysts (NOA)						
HT	13.8531	11.0000	15.5305	13.0000	-3.96***	-3.95***
LT	10.3333	9.0000	9.5028	10.0000	2.89***	2.66***

<sup>a</sup> The definitions of these variables are given below with annual COMPUSTAT items in parentheses:

SIZE = nsales (12) / total assets (6);

RNDA = Research and Development expenses (46) divided by total assets (6);

SGAS = selling, general, and administration expenses (189) divided by net sales (12);

SPECS = special items (17) divided by net sales (12);

DEBTA = long-term debt plus the current portion of long-term debt (9 + 34) divided by total assets (6),

MTBA = Market-to-Book value of assets = market value of total assets (6 - 60 + 199 \* 25) divided by book value of total assets (6); and

NOA = Number of Analysts (NOA) from the IBES file who provided earnings per share forecast data for HT(LT) firms.

T-tests are performed between two sample periods – 1998-2000 and 2002-2004 periods. The symbols of \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.

**TABLE 3**  
**10-Q Filing Days in the SOX year for HT and LT Firms**

Panel A: HT firms				
Period		Pre-SOX	Post-Sox	Total
<i>Number of Filings</i>				
Total	All	144	144	288
Weekday	Mon	23	5	28
	Tue	38	38	76
	Wed	48	27	75
	Thu	15	61	76
	Fri	20	13	33

Panel B: LT firms				
Period		Pre-SOX	Post-Sox	Total
<i>Number of Filings</i>				
Total	All	85	85	170
Weekday	Mon	11	7	18
	Tue	28	24	52
	Wed	25	17	42
	Thu	11	25	36
	Fri	10	12	22

**TABLE 4**  
**Stock Return Variability (CVR) at Quarterly Report Disclosure Dates around the SOX**  
**Fiscal Year 2002<sup>a</sup>**

Variable	<u>CVR</u>				Matched-Pair Wilcoxon	
	<u>Last Quarter before SOX</u>		<u>Second Quarter after SOX</u>		Student's	Signed-Rank
	Mean	Median	Mean	Median	t	Z
<b>Panel A: Three-Day Window (day[-1] thru day[+1])</b>						
<i>Patell's CVR</i>						
<b>HT</b>	1.1711	0.8507	0.7278	0.4033	2.78***	4.43***
<b>LT</b>	1.1709	0.4134	1.0019	0.4423	0.47	0.09
<i>Beaver's CVR</i>						
<b>HT</b>	1.2168	0.8807	0.7515	0.4166	2.83***	
4.46***						
<b>LT</b>	1.2172	0.4277	1.0356	0.4569	0.49	0.64
<i>Mean-Adjusted CVR</i>						
<b>HT</b>	1.4409	1.0264	0.7098	0.4484	5.01***	
5.57***						
<b>LT</b>	1.2759	0.5175	1.1131	0.5207	0.50	0.58
<b>Panel B: Five-Day Window (day[-2] thru day [+2])</b>						
<i>Patell's CVR</i>						
<b>HT</b>	1.1767	0.9411	0.7089	0.4181	3.56***	
4.63***						
<b>LT</b>	1.0611	0.5656	0.8683	0.4978	0.84	1.12
<i>Beaver's CVR</i>						
<b>HT</b>	1.2224	0.9814	0.7321	0.4302	3.61***	
4.66***						
<b>LT</b>	1.1025	0.5868	0.8983	0.5128	0.86	1.17
<i>Mean-Adjusted CVR</i>						
<b>HT</b>	1.4322	0.9821	0.7106	0.5238	5.73***	
5.83***						
<b>LT</b>	1.1719	0.6489	1.0311	0.6159	0.65	1.35
<b>Panel C: Forecast Dispersion<sup>b</sup></b>						
<b>HT</b>	0.0277	0.0160	0.0214	0.0160	1.66*	0.68
<b>LT</b>	0.0376	0.0190	0.0248	0.0170	1.85*	1.56

<sup>a</sup> A cumulative variance of returns [Patell's (1976) CVR] metric is computed as follows

$$CVR_{i,L} = 1/L \sum_{K=1}^L \{ [u_{i,k}^2 (Ti - 4)] / [S_i^2 C_{i,k} (Ti - 2)] \}$$

$u_{i,k} = R_{i,k} - (\alpha_i + \beta_i R_{M,k})$  where  $R_{i,k}$  is the daily stock return for firm  $i$  on day  $k$ , and  $R_{M,k}$  is the return on an equally weighted market portfolio for day  $k$ . The model's parameters,  $\alpha_i$  and  $\beta_i$ , are derived from firm-specific regressions using past returns, where the estimation period extends from day  $\{-130\}$  to day  $\{-11\}$  (i.e., 120 daily returns), and day  $\{0\}$  is the filing date of Form 10-Q. The market model is estimated separately for each quarter of every firm. Beaver's (1968) CVR and McNichols and Manegold's (1983) mean-adjusted CVR are also calculated for the comparison purpose, and their detailed descriptions are provided in the methodology section. The symbols of \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.

<sup>b</sup> Forecast dispersion (FD) is measured as follows:

$FD_{it} = |SD_{it} / FEPS_{it}|$  Where  $SD_{it}$  = standard deviation of financial analysts' forecasts for firm  $i$  in year  $t$  (the number of analysts  $\geq 3$ ).  $FEPS_{it}$  = mean financial analysts' earnings forecast for *current year* made in the fiscal-year-end month for firm  $i$ . Fiscal years 2001 and 2002 were compared.

**TABLE 5**  
**Mean-Adjusted Trading Volume at Quarterly Report Disclosure Dates around the SOX**  
**Fiscal Year 2002<sup>a</sup>**

Variable	<u>CAVOL</u>				Matched-Pair Wilcoxon	
	<u>Last Quarter before SOX</u>		<u>Second Quarter after SOX</u>		Student's	Signed-Rank
	Mean	Median	Mean	Median	t	Z
<b>Panel A: Three-Day Window (day[-1] thru day[+1])</b>						
<b>HT</b>	0.0002	-0.0002	-0.0013	-0.0008	1.42	2.26**
<b>LT</b>	0.0005	0.0001	-0.0008	-0.0009	1.99**	2.84***
<b>Panel B: Five-Day Window (day[-2] thru day [+2])</b>						
HT	-0.0003	-0.0001	-0.0014	-0.0010	1.13	2.59***
LT	0.0003	-0.0002	-0.0007	-0.0007	1.56	2.03**

<sup>a</sup> A cumulative abnormal volume metric (CAVOL) is computed as follows

$$CAVOL_{i,L} = 1/L \sum_{K=1}^L MADJVOL_{i,k}$$

where

$MADJVOL_{i,k} = V_{i,k} - MVOL_i$ ;

$MADJVOL_{i,k}$  = the announcement-period mean-adjusted relative volume ;

$V_{i,k}$  = relative volume or

trading volume / shares outstanding, for firm i in day k;

$MVOL_i$  = the mean relative volume during the estimation period.

The estimation period extends from day {-130} to day {-11} (i.e., 120 daily volumes), and day {0} is the filing date of Form 10-Q.

The symbols of \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.

**TABLE 6**  
**Mean-Adjusted Trading Volume Variability at Quarterly Report Disclosure Dates around**  
**the SOX**  
**Fiscal Year 2002<sup>a</sup>**

Variable	<u>CVRVOL</u>				Matched-Pair Wilcoxon	
	<u>Last Quarter before SOX</u>		<u>Second Quarter after SOX</u>		Student's	Signed-Rank
	Mean	Median	Mean	Median	t	Z
<b>Panel A: Three-Day Window (day[-1] thru day[+1])</b>						
<b>HT</b>	1.8381	0.3433	0.7776	0.2785	1.21	1.52
<b>LT</b>	1.6377	0.3569	0.6511	0.2934	2.11**	1.37
<b>Panel B: Five-Day Window (day[-2] thru day [+2])</b>						
<b>HT</b>	1.4679	0.4142	0.8400	0.3147	1.12	2.12**
<b>LT</b>	1.4460	0.3904	0.6905	0.3706	1.98*	1.43

<sup>a</sup> A cumulative variance of volumes metric (CVRVOL), similar to a mean-adjusted CVR, is computed as follows

$$CVRVOL_{i,L} = 1/L \sum_{K=1}^L (VOL_{i,k}^2 / SVOL_i^2)$$

where

$VOL_{i,k} = V_{i,k} - MVOL_i$ ;

$VOL_{i,k}$  = the announcement-period abnormal relative volume ;

$V_{i,k}$  = relative volume or

trading volume / shares outstanding, for firm i in day k;

$SVOL_i$  = the standard deviation of relative volumes during the estimation period;

and

$MVOL_i$  = the mean relative volume during the estimation period.

The estimation period extends from day {-130} to day {-11} (i.e., 120 daily volumes), and day {0} is the filing date of Form 10-Q.

The symbols of \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.

**TABLE 7**  
**The Relationship between Price Variability and Information Environment Variables**  
**around 10-Q filing dates in the SOX year**  
**HT**  
**(t-statistics in parentheses)<sup>a,b</sup>**

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Model:  $CVR_{i,t} = \beta_0 + \beta_1 IN_{i,t} + \beta_2 QDUM_{i,t} + \beta_3 WK_{i,t} + \beta_4 MC_{i,t} + \beta_5 AA_{i,t} + \varepsilon_{i,t}$

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	<u>Patell's CVR</u>		Predicted Sign	<u>Mean-Adjusted CVR</u>	
	[-1,+1]	[-2,+2]		[-1,+1]	[-2,+2]
$\beta_0$ (Intercept)	-1.293E-16 (-0.00)	-2.040E-16 (-0.00)		6.328E-16 (0.00)	-4.078E-16 (-0.00)
$\beta_1$ (IN)	0.008 (0.12)	0.052 (0.83)	+	-0.026 (-0.42)	-0.022 (-0.37)
$\beta_2$ (QDUM)	-0.157 (-2.50)**	-0.177 (-2.86)***	-	-0.298 (-4.90)***	-0.313 (-5.23)***
$\beta_3$ (WK)	0.010 (0.15)	0.103 (1.66)*	+	-0.033 (-0.55)	0.078 (1.30)
$\beta_4$ (MC)	0.055 (0.94)	0.045 (0.78)	-	0.070 (1.23)	0.040 (0.70)
$\beta_5$ (AA)	0.001 (0.01)	-0.011 (-0.19)	+	0.031 (0.54)	-0.001 (-0.02)
<u>F-Value:</u>	1.68	3.36***		5.46***	7.29***
<u>R<sup>2</sup> (Adj. R<sup>2</sup>):</u>	0.029 (0.012)	0.056 (0.040)		0.088 (0.072)	0.115 (0.099)

Number of Observations: N=288 for all regression models

VIF (Variance Inflation Factor):  
1.012 (AA) - 1.158 (IN) for all regression models

<sup>a</sup> \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.

<sup>b</sup> where for firm i in year t:

IN = Information Intensity (1=high, 0=low); QDUM=(0=the quarter right before SOX, 1=the second quarter following SOX); WK=midweek filing (Mon, Fri=1, otherwise 0); MC=market capitalization (greater than median at the end of the quarter = 1, otherwise 0); and AA=accounting accruals (greater than median =1, otherwise 0).

**TABLE 8**  
**The Relationship between Price Variability and Information Environment Variables**  
**around 10-Q filing dates in the SOX year**  
**LT**  
**(t-statistics in parentheses)<sup>a,b</sup>**

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Model:  $CVR_{i,t} = \beta_0 + \beta_1 IN_{i,t} + \beta_2 QDUM_{i,t} + \beta_3 WK_{i,t} + \beta_4 MC_{i,t} + \beta_5 AA_{i,t} + \varepsilon_{i,t}$

	<u>Patell's CVR</u>		Predicted Sign	<u>Mean-Adjusted CVR</u>	
	[-1,+1]	[-2,+2]		[-1,+1]	[-2,+2]
$\beta_0$ (Intercept)	-4.478E-17 (-0.00)	-3.056E-16 (-0.00)		2.472E-16 (0.00)	2.612E-16 (0.00)
$\beta_1$ (IN)	-0.077 (-0.88)	-0.061 (-0.70)	+	-0.034 (-0.39)	-0.047 (-0.54)
$\beta_2$ (QDUM)	-0.062 (-0.76)	-0.083 (-1.01)	+/-	-0.051 (-0.62)	-0.064 (-0.78)
$\beta_3$ (WK)	-0.132 (-1.63)	-0.107 (-1.32)	+	-0.107 (-1.32)	-0.081 (-1.00)
$\beta_4$ (MC)	0.069 (0.88)	0.085 (1.09)	-	0.089 (1.13)	0.116 (1.48)
$\beta_5$ (AA)	-0.021 (-0.26)	-0.029 (-0.37)	+	-0.041 (-0.51)	-0.031 (-0.39)
<u>F-Value:</u>	0.86	0.84		0.78	0.85
<u>R<sup>2</sup> (Adj. R<sup>2</sup>):</u>	0.026 (-0.004)	0.025 (-0.005)		0.023 (-0.007)	0.025 (-0.004)

Number of Observations: N=170 for all regression models

VIF (Variance Inflation Factor):  
1.034 (MC) - 1.285 (IN) for all regression models

<sup>a</sup> \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.

<sup>b</sup> where for firm i in year t:

IN = Information Intensity (1=high, 0=low); QDUM=(0=the quarter right before SOX, 1=the second quarter following SOX); WK=midweek filing (Mon, Fri=1, otherwise 0); MC=market capitalization (greater than median at the end of the quarter = 1, otherwise 0); and AA=accounting accruals (greater than median =1, otherwise 0).

**Table 9**  
**Conservatism Metrics: Cumulative Non-operating Accruals (CNA) and Performance-Matched Discretionary Accruals (PMDA)**  
**Pre SOX versus Post SOX period<sup>a,b</sup>**

1998-2000		2002-2004		Matched-Pair Student's t	Wilcoxon Signed-Rank Z	
Mean	Median	Mean	Median			
Panel A: CNA						
HT:	-0.239	-0.024	-1.672	-0.028	1.61*	-0.21
LT:	-0.014	-0.012	-0.023	-0.014	1.19	1.24
Panel B: PMDA						
HT:	-2.225	-0.037	-11.590	-0.106	3.18***	1.41
LT:	0.004	-0.011	-0.101	-0.008	0.24	1.61*

<sup>a</sup> Total accruals (before depreciation) = Net Income before Depreciation – Cash Flows from Operations; Non-operating Accruals = Total Accruals (before depreciation) – Operating Accruals; and Operating Accruals =  $\Delta$ Accounts Receivable +  $\Delta$ Inventories +  $\Delta$ Prepaid Expenses -  $\Delta$ Accounts Payable -  $\Delta$ Taxes Payable. Cumulative non-operating accruals (CNA) are deflated by net sales.

$PMDA_{i,t}$  = performance-matched discretionary accruals deflated by lagged assets; calculated as discretionary accruals of firm i estimated from Modified Jones model minus discretionary accruals of firm j that has the closest ROA in the same industry,

<sup>b</sup> The symbols of \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.

**Table 10**  
**Conservatism Metrics: Cumulative Non-operating Accruals (CNA) and Performance-Matched Discretionary Accruals (PMDA)**  
**High-Tech versus Low-Tech Firms<sup>a,b</sup>**

	HT		LT		Two Sample Student's t	Wilcoxon Rank-Sum Z
	Mean	Median	Mean	Median		
Panel A: CNA						
1998-2000:	-0.239	-0.024	-0.014	-0.012	-3.54 ***	-4.30 ***
2002-2004:	-1.672	-0.028	-0.023	-0.014	-1.86 *	-3.65 ***
Panel B: PMDA						
1998-2000:	-2.225	-0.037	0.004	-0.011	-4.63 ***	-1.73 *
2002-2004:	-11.590	-0.106	-0.101	-0.008	-3.85 ***	-0.52

<sup>a</sup> Total accruals (before depreciation) = Net Income before Depreciation – Cash Flows from Operations; Non-operating Accruals = Total Accruals (before depreciation) – Operating Accruals; and Operating Accruals =  $\Delta$ Accounts Receivable +  $\Delta$ Inventories +  $\Delta$ Prepaid Expenses -  $\Delta$ Accounts Payable -  $\Delta$ Taxes Payable. Cumulative non-operating accruals (CNA) are deflated by net sales.

$PMDA_{i,t}$  = performance-matched discretionary accruals deflated by lagged assets; calculated as discretionary accruals of firm i estimated from Modified Jones model minus discretionary accruals of firm j that has the closest ROA in the same industry,

<sup>b</sup> The symbols of \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.

**Table 11**  
**Conservatism Metrics: Basu's Accounting Conservatism Measure**  
**High-Tech versus Low-Tech Firms**

*Panel A: OLS Regression<sup>a</sup>*

$$\begin{aligned} \text{Earnings} = & \alpha_0 + \alpha_1 * \text{Post}_{it} + \alpha_2 * \text{LTC}_{it} + \alpha_3 * \text{LTC}_{it} * \text{Post}_{it} \\ & + \beta_0 * \text{D}_{it} + \beta_1 * \text{Post}_{it} * \text{D}_{it} + \beta_2 * \text{LTC}_{it} * \text{D}_{it} + \beta_3 * \text{LTC}_{it} * \text{Post}_{it} * \text{D}_{it} \\ & + \gamma_0 * \text{Return}_{it} + \gamma_1 * \text{Post}_{it} * \text{Return}_{it} + \gamma_2 * \text{LTC}_{it} * \text{Return}_{it} + \gamma_3 * \text{LTC}_{it} * \text{Post}_{it} * \text{Return}_{it} \\ & + \phi_0 * \text{D}_{it} * \text{Return}_{it} + \phi_1 * \text{Post}_{it} * \text{D}_{it} * \text{Return}_{it} + \phi_2 * \text{LTC}_{it} * \text{D}_{it} * \text{Return}_{it} + \phi_3 * \text{LTC}_{it} * \text{Post}_{it} * \text{D}_{it} \\ & * \text{Return}_{it} + \varepsilon_{it} \end{aligned}$$

Variables	Estimated Coefficient t-statistic		
Intercept	-0.0205	-2.75	***
Post	0.0166	1.48	
LTC	0.0774	5.94	***
LTC*Post	-0.0358	-1.82	*
D	-0.0032	-0.25	
Post*D	-0.0228	-1.06	
LTC*D	0.0146	0.69	
LTC*Post*D	-0.0198	-0.52	
Return	-0.0097	-1.6	
Post*Return	-0.0306	-3.28	***
LTC*Return	-0.0019	-0.12	
LTC*Post*Return	0.0479	2.02	**
D*Return	0.0590	2.53	**
Post*D*Return	0.0755	1.34	
LTC*D*Return	0.1185	2.59	***
LTC*Post*D*Return	0.0185	0.14	
N	3517		
Adjusted R <sup>2</sup>	6.70%		

**Table 11 continued**

*Panel B: Test of conservatism*

	HT	LT	HT vs. LT
<i>Good news (positive returns)</i>			
Coefficient	$\gamma_1$	$\gamma_1 + \gamma_3$	$\gamma_3$
	-0.0306	0.0173	0.0479
F-value	3.28 ***	0.63	2.02 **
Expected sign if more conservative after SOX	negative	negative	positive
<i>Bad news (negative returns)</i>			
Coefficient	$\gamma_1 + \phi_1$	$\gamma_1 + \gamma_3 + \phi_1 + \phi_3$	$\gamma_3 + \phi_3$
	0.0449	-0.1641	0.0664
F-value	0.66	0.97	0.28
Expected sign if more conservative after SOX	positive	positive	negative

<sup>a</sup> Post is a dummy variable that takes the value of one if the observation is after 2002 and takes the value of zero if it is before 2002; LTC is a dummy variable that takes the value of one if the firm is classified as a low-tech firm and takes the value of zero otherwise; D is a dummy variable that takes the value of one if the stock return is negative and takes the value of zero if it is positive; Return is the 12-month stock return of the firm for the fiscal year.

The symbols of \*, \*\*, and \*\*\* indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed test

**Appendix A**  
**DELPHI CORPORATION**  
**FORM 10-Q**  
**As of September 30, 2002**

**ITEM 4. CONTROLS AND PROCEDURES**

At the beginning of the third quarter, in response to recent legislation and additional requirements, we reviewed our internal control structure and our disclosure controls and procedures. As a result of such review we implemented minor changes, primarily to formalize and document the already robust procedures in place. We have designed our disclosure controls and procedures to ensure that material information related to Delphi, including our consolidated subsidiaries, is made known to our disclosure committee, including our principal executive officer and principal financial officer on a regular basis, in particular during the period in which the quarterly reports are being prepared. As required, we will evaluate the effectiveness of these disclosure controls and procedures on a quarterly basis, and did so on October 11, 2002, a date within 90 days prior to the filing of this quarterly report. We believe as of that date, such controls and procedures are operating effectively as designed.

We presented the results of our most recent evaluation to our independent auditors, Deloitte and Touche LLP, and the Audit Committee of the Board of Directors. Based on such evaluation, the Company's management, including the principal executive officer and principal financial officer, concluded that the Company's disclosure controls and procedures are adequate to insure the clarity and material completeness of the Company's disclosure in its periodic reports required to be filed with the SEC and there are no significant deficiencies in the design or operation of internal controls which could significantly affect our ability to record, process, summarize and report financial data.

**Appendix B**  
**INTEL CORPORATION**  
**FORM 10-Q**

**As of September 28, 2002**

**Item 4. Controls and Procedures**

**Quarterly evaluation of the company's Disclosure Controls and Internal Controls.** Within the 90 days prior to the date of this Quarterly Report on Form 10-Q, the company evaluated the effectiveness of the design and operation of its "disclosure controls and procedures" (Disclosure Controls), and its "internal controls and procedures for financial reporting" (Internal Controls). This evaluation (the Controls Evaluation) was done under the supervision and with the participation of management, including our Chief Executive Officer (CEO) and Chief Financial Officer (CFO). Rules adopted by the SEC require that in this section of the Quarterly Report we present the conclusions of the CEO and the CFO about the effectiveness of our Disclosure Controls and Internal Controls based on and as of the date of the Controls Evaluation.

**CEO and CFO Certifications.** Appearing immediately following the Signatures section of this Quarterly Report there are two separate forms of "Certifications" of the CEO and the CFO. The first form of Certification is required in accord with Section 302 of the Sarbanes-Oxley Act of 2002 (the Section 302 Certification). This section of the Quarterly Report which you are currently reading is the information concerning the Controls Evaluation referred to in the Section 302 Certifications and this information should be read in conjunction with the Section 302 Certifications for a more complete understanding of the topics presented.

**Disclosure Controls and Internal Controls.** Disclosure Controls are procedures that are designed with the objective of ensuring that information required to be disclosed in our reports filed under the Securities Exchange Act of 1934 (Exchange Act), such as this Quarterly Report, is recorded, processed, summarized and reported within the time periods specified in the Securities and Exchange Commission's (SEC) rules and forms. Disclosure Controls are also designed with the objective of ensuring that such information is accumulated and communicated to our management, including the CEO and CFO, as appropriate to allow timely decisions regarding required disclosure. Internal Controls are procedures which are designed with the objective of providing reasonable assurance that (1) our transactions are properly authorized; (2) our assets are safeguarded against unauthorized or improper use; and (3) our transactions are properly recorded and reported, all to permit the preparation of our financial statements in conformity with generally accepted accounting principles.

**Limitations on the Effectiveness of Controls.** The company's management, including the CEO and CFO, does not expect that our Disclosure Controls or our Internal Controls will prevent all error and all fraud. A control system, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within the company have been detected. These inherent limitations include the realities that judgments in decision-making can be faulty, and that breakdowns can occur because of simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people, or by management override of the control. The design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, control may become inadequate because of changes in conditions, or the degree of compliance with the policies or procedures may deteriorate. Because of the inherent limitations in a cost-effective control system, misstatements due to error or fraud may occur and not be detected.

**Scope of the Controls Evaluation.** The CEO/CFO evaluation of our Disclosure Controls and our Internal Controls included a review of the controls' objectives and design, the controls' implementation by the company and the effect of the controls on the information generated for use in this Quarterly Report. In the course of the Controls Evaluation, we sought to identify data errors, controls problems or acts of fraud and to confirm that appropriate corrective action, including process improvements, were being undertaken. This type of evaluation will be done on a quarterly basis so that the conclusions concerning controls effectiveness can be reported in our Quarterly Reports on Form 10-Q and Annual Report on Form 10-K. Our Internal Controls are also evaluated on an ongoing basis by our Internal Audit Department, by other personnel in our Finance organization and by our independent auditors in connection with their audit and review activities. The overall goals of these various evaluation activities are to monitor our Disclosure Controls and our Internal Controls and to make modifications as necessary; our intent in this regard is that the Disclosure Controls and the Internal Controls will be maintained as dynamic systems that change (including with improvements and corrections) as conditions warrant.

Among other matters, we sought in our evaluation to determine whether there were any "significant deficiencies" or "material weaknesses" in the company's Internal Controls, or whether the company had identified any acts of fraud involving personnel who have a significant role in the company's Internal Controls. This information was important both for the

Controls Evaluation generally and because items 5 and 6 in the Section 302 Certifications of the CEO and CFO require that the CEO and CFO disclose that information to our Board's Audit Committee and to our independent auditors and to report on related matters in this section of the Quarterly Report. In the professional auditing literature, "significant deficiencies" are referred to as "reportable conditions"; these are control issues that could have a significant adverse effect on the ability to record, process, summarize and report financial data in the financial statements. A "material weakness" is defined in the auditing literature as a particularly serious reportable condition where the internal control does not reduce to a relatively low level the risk that misstatements caused by error or fraud may occur in amounts that would be material in relation to the financial statements and not be detected within a timely period by employees in the normal course of performing their assigned functions. We also sought to deal with other controls matters in the Controls Evaluation, and in each case if a problem was identified, we considered what revision, improvement and/or correction to make in accord with our on-going procedures.

In accord with SEC requirements, the CEO and CFO note that, since the date of the Controls Evaluation to the date of this Quarterly Report, there have been no significant changes in Internal Controls or in other factors that could significantly affect Internal Controls, including any corrective actions with regard to significant deficiencies and material weaknesses.

**Conclusions.** Based upon the Controls Evaluation, our CEO and CFO have concluded that, subject to the limitations noted above, our Disclosure Controls are effective to ensure that material information relating to Intel and its consolidated subsidiaries is made known to management, including the CEO and CFO, particularly during the period when our periodic reports are being prepared, and that our Internal Controls are effective to provide reasonable assurance that our financial statements are fairly presented in conformity with generally accepted accounting principles.