VALUE RELEVANCE OF KEY ACCOUNTING INFORMATION AND EARNINGS MANAGEMENT: HIGH-TECH VERSUS LOW-TECH FIRMS

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Abstract

This paper examines the value-relevance of primary accounting information and the size of earnings management concurrently for high-tech versus low-tech firms. Specifically, the results reveal that earnings and changes in earnings of high-tech firms reflect lower levels of security price reactions and associations than those of low-tech firms. In addition, consistent with evidence from prior research, greater levels of earnings management, measured by modified Jones and performance-matched discretionary accruals (proxies for earnings management), exist for high-tech firms vis-à-vis low-tech firms over the sample period. More importantly, this paper also documents that the association between cumulative adjusted returns and key financial variables, including earnings, changes in earnings, sales, and changes in sales, remains weaker for high-tech firms than for low-tech firms even after levels of earnings management have been controlled for.

Keywords: High-Tech, Low-Tech, Value-Relevance, Earnings Management, Accruals

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1. Introduction

It has been frequently debated in contemporary accounting literature that financial data of high-tech firms are less value relevant than those of low-tech firms in this New Economy characterized by information network technology including the Internet, Intranet, Extranet, and wireless services.[3]

Recently, Amir and Lev (1996) examine independent cellular companies and conclude that nonfinancial variables, such as total population in the licensed area (a growth proxy) and market penetration (an operating performance proxy), account for stock prices better than financial indicators, such as earnings and cash flow from operations. Trueman, Wong and Zhang (2000) are also unable to detect a significant positive association between net income and market prices. Hand (2000) challenges the conventional presumption that financial information maps into stock price in a linear and stationary manner for Internet firms and finds that Internet firms' market values are linear in book equity, but concave and increasing (decreasing) in positive (negative) net income.

In response to similar concerns, Francis and Schipper (1999) examine the claim that financial accounting information has become less value relevant over time. They find mixed evidence in support of this proposition. They also investigate the extent to which the decline in value relevance over time, if any, is greater for high-tech than for low-tech firms and conclude that high-tech firms do not experience a greater decline in value relevance vis-à-vis low-tech firms.

Revisiting the issue of value relevance is important because Amir and Lev (1996) and others find evidence that the financial information of high-tech firms is irrelevant but the analysis is limited to one industry/sector and does not compare the value relevance of financial information across samples of high- and low-tech firms. In contrast, Francis and Schipper (1999) do compare samples of high- and low-tech firms but fail to find evidence of differential value relevance. Their sample period, however, spans almost half a century (1952-94) given that New

[3] A recent article (BusinessWeek; October 20, 2003), entitled "The Productivity Boom Is Just Warming Up," by the 1992 Nobel Laureate – Professor Gary Becker at the University of Chicago provides an additional incentive to compare high-tech firms with their low-tech counterparts. He argues,

"I continue to believe that even after the burst of the bubbles in *high-tech stocks,* the U.S. economy is in the relatively early stages of a major technological revolution… The large spurt in technological progress during the past eight years is mainly due to a series of developments: rapid progress in computer capabilities, the explosive growth of the Internet, advances in cellular and other wireless technologies, the growth of fiber optics, advances in biotech, greater world competition for U.S. companies, which induced improvements in business efficiency, and myriad other smaller improvements in technology."

Economy stocks have been in the limelight only after the Internet was developed in the early 1990s. Accordingly, the investigation of value relevance issues associated with high-tech and low-tech firms can become more meaningful if the sample period is limited to the most recent decade (1990-98), as is the focus in this study.

In recent years, investors, analysts, and other market participants are monitoring the extent to which a firm's earnings meet or exceed analyst forecasts closely. Skinner and Sloan (2002) find that the stock market's reaction to failure to achieve these benchmarks is large and asymmetric: the absolute magnitude of the price response to negative surprises significantly exceeds the price response to positive surprises, particularly for growth stocks. This suggests that high-tech firms that miss analyst expectations incur a high cost. Pressure on high-tech companies to meet or beat expectations, to grow market capitalization, and to avoid the litigation costs potentially triggered by unfavorable earnings surprises can prompt CEOs to manage earnings to match the analyst forecast when they otherwise would miss the benchmark. Consistent with the above conjecture, Teoh, Welch, and Wong (1998) find that earnings management is prevalent particularly in the computer and electronics industries (i.e., high-tech industries).[4] Recently, Kwon and Yin (2006) also document that high-tech firms are more likely to reward managers who use discretionary accruals to meet earnings forecasts. The empirical evidence of these studies suggests that the size of earnings management is likely to be greater for high-tech firms than for low-tech firms.

In general, when managers responsibly use earnings management to convey inside information about future earning power, the stock market positively responds to discretionary accruals (i.e., a proxy for earnings management) as evidenced in studies such as Subramanyam (1996), Liu, Ryan, and Wahlen (1997), Barth, Elliott, and Finn (1999). However, when managers opportunistically use earnings management, the stock market negatively reacts to bad earnings management. Elliott and Hanna (1996) demonstrates that the ERC for a dollar of quarterly core earnings is lower for companies that have considerable, frequently reported amounts of unusual and non-recurring charges than for firms that have not reported such charges.

As such, the empirical results of these prior research studies on earnings management lead us to believe that differences in value relevance of key financial variables such as earnings, changes in earnings, sales, and changes in sales between high-tech firms and low-tech firms can be affected by the level of earnings management that may differ between two sectors.

The purpose of this study is two-fold: (1) to examine whether or not earnings and changes in earnings of high-tech firms are more deficient in asset valuation than those of low-tech firms and (2) to explore whether or not differences, if any, in the value relevance of key accounting information including earnings, changes in earnings, sales, and changes in sales between high-tech and low-tech firms remain robust after controlling for the size of earnings management.

The first set of tests reveals that the reaction of stock returns to earnings and changes in earnings in a short-window analysis for the sample of high-tech (HTC) firms is indeed insignificant whereas the reaction of stock return to a change in earnings for low-tech (LTC) firms is statistically significant at the 1% level in two-tailed tests. Moreover, the adjusted R^2 for low-tech firms is consistently higher (on average more than three times) than that for high-tech firms, thus confirming the lower level of price reaction in high-tech firms to primary accounting variables such as earnings and changes in earnings.[5]

A recent study by Hayn (1995) shows that pooling profitable and loss observations in samples used by researchers to estimate the information content of earnings leads to a downward bias in the estimated earnings coefficient and the return-earnings association. Consistent with Hayn (1995), we find the stock return reaction only in positive earnings cases but no statistically significant reaction in the negative cases. The adjusted R^2 for low-tech firms is still 1.5 times higher than that of high-tech firms even with only positive earnings observations used in the analysis.

Further analyses, using a long-window, of the association between financial statement variables, such as earnings, change in earnings, assets, liabilities, and book value of equity, and stock returns indicate that high-tech firms have weaker earnings relations, but indistinguishable relations in balance sheet, and book value & earnings when compared to low-tech firms. This evidence is consistent with the results of Hand (2000) in that Internet (high-tech) firms' market values are linear and increasing in book value of equity (i.e., Assets and Liabilities), but concave and increasing (decreasing) in positive (negative) net income. Also, the results of book value & earnings relations are consistent with the

4 Since shareholders of high-tech firms cannot observe the set of investment opportunities from which the manager chooses, the information asymmetry between shareholders and the management is high. In such a case, managers are more likely to signal performance using discretionary accruals.

5 In value-relevance tests, the short-window analysis is expected to complement the long-window analysis in that the former focuses on the reaction of a firm's equity price to its financial information at an earnings announcement date whereas the latter aims at the association between a firm's market value and its financial information for the period of a fiscal year. When the results of both analyses converge, an unambiguous conclusion can be drawn concerning the difference in the value-relevance between high-tech and low-tech firms.

theoretical predictions of Zhang (2000) in that under conservative accounting, firm growth is shown to play an important role in combining book value and earnings in equity valuation.[6]

The second set of tests examines the extent to which lesser value-relevance of key accounting information in high-tech firms is explained by the greater size of discretionary accruals. Two measures – discretionary accruals based on the cross-sectional modified Jones model and the performance-matched model based on Kothari, Leone, and Wasley (2005) - of earnings management are adopted. Indeed, high-tech firms are engaged in greater levels of earnings management throughout the sample period 1990-1998, compared to low-tech firms. In addition, high-tech firms implemented more income-decreasing earnings management methods than low-tech firms during the same sample period, consistent with the results of Kwon, Yin, and Han (2006). The results from joint tests of value-relevance and the size of earnings management indicate that differential levels of earnings management fail to explain the findings of differential value relevance between high-tech and low-tech firms. In other words, the lesser value relevance of financial information of high-tech firms is persistent even when the levels of earnings management have been controlled for. One explanation might be differential market efficiency. Given the period of the 1990s is characterized by the irrational exuberance of U.S. stock markets and the formation of record budget surpluses from government tax revenues, most high-tech firms were able to attract large amounts of capital in the financial market regardless of the size of earnings (losses) reported in their income statements.[7]

This study contributes to the accounting/finance literature in two ways. First, although numerous studies have examined the inter-temporal properties of financial numbers including both value relevance and levels of earnings management, this study, to our knowledge, is the first to examine both issues of differential value relevance and differential levels of earnings management concurrently from a cross-sectional perspective in a uniquely contrasted setting of New Economy (high-tech) and Old Economy (low-tech) firms.

Second, the beginning of this paper's sample period approximately coincides with the advent of the World Wide Web in 1991 which has turned the Internet into a commercial instrument and whose pervasive use has led to the start of the New Economy. Therefore, the analysis of differential value relevance between high-tech (New Economy) and low-tech (Old Economy) firms can become more meaningful in this study than in previous studies which examine the afore-mentioned issue of value relevance for the period prior to the 1990s.

The remainder of this study is organized as follows. The next section describes the hypotheses development. The third section deals with sample selection procedures and the measurement of variables. The fourth section reports results of empirical tests involving value-relevance of financial statements data and earnings management. Section five reports on sensitivity tests. Concluding comments are offered in the final section.

2. Hypotheses Development

Amir and Lev [1996] investigate fourteen independent cellular companies for a ten year period between 1984-1993, using regression methodology and quarterly financial data. They find that financial information – earnings, book values, and operating cash flows – are largely irrelevant on a stand-alone basis for the valuation of cellular companies. They further note that nonfinancial variables, such as total population in the licensed area (a growth proxy) and market penetration (an operating performance proxy), account for stock prices better than financial indicators. These nonfinancial data are more closely aligned with customer acquisition and brand development (i.e., intangibles that affect future cash flows) than with tangible-asset based current operations. According to their findings, they advise that the traditional focus of accounting researchers on financial information can be overly restrictive and may lead to unwarranted conclusions. The accumulation of such evidence for the high-tech sector in its entirety, therefore, should improve the generality of their findings, which is one of the two primary objectives of this paper.

Trueman, Wong and Zhang (2000) also fail to detect a significant positive association between net income and market prices. Hand (2000) challenges the conventional assumption that financial information maps into stock price in a linear and stationary manner for Internet firms and finds that Internet firms' market values are linear in book equity, but nonlinear and increasing (decreasing) in positive (negative) net income.

More recently, Francis and Schipper (1999) similarly relate the failure of high-tech firms to recognize intangible assets whose expected future cash flows are relevant to investors in a balance sheet and their untimely recognition of such intangibles as expenses in an income statement to the decrease in value-relevance of a firm's financial statements. The unrecorded intangible assets particularly relevant to high-tech firms are R&D spending, customer acquisition costs, and brand development costs. There are two frequently cited proxies for unrecorded intangible assets: R&D spending as a percentage of

[6] Kwon and Yin (2006) show that high-tech firms have greater investment opportunities (growth potential) than low-tech firms. Their differences are statistically significant at 0.0001 level.

[7] Differential market efficiency between high-tech and low-tech firms might provide a fruitful avenue for future research.

total assets and market-to-book ratios. According to Francis and Schipper (1999), the across-year average (1952-94) of market-to-book ratio (R&D as a percentage of total assets) for high-tech firms is 3.18 (9.2%) , compared to 1.57 (0.8%) for low-tech firms. Both measures of intangible assets significantly differ between two samples at the 0.0001 levels. Given that their results provide mixed support for the view that financial statements are less relevant for high-tech firms than for low-tech firms, it is worthwhile to revisit the issue using a different sample period (the 1990s only).[8] This is due to the recent distinction made between the New Economy and Old Economy within the communication networks of the business community (footnote 1), and the emergence of the World Wide Web in 1991 which has turned the Internet into a commercial vehicle.[9]

Therefore, we expect there will be a systematic difference in the level of value-relevance of financial statements data between high- and low-tech firms. The following hypotheses in their alternate forms are constructed based on the above discussion:

H1: High-tech firms will show a smaller reaction of firm-specific returns to earnings and change in earnings than low-tech firms at the time of earnings announcement.

H2: High-tech firms will show a lesser association of unadjusted returns (or market-adjusted returns) with earnings, assets, liabilities, and book value of equity than low-tech firms.

Prior research by Guay, Kothari, and Watts (1996), Dechow, Kothari, and Watts (1998), and Richardson et al. (2005), Fairfield, Whisenant, and Yohn (2003) linked accruals with business growth. Gul, Leung, and Srinidhi (2000) find a higher positive association between discretionary accruals and future profits in high-IOS firms, and find that the market prices discretionary accruals significantly higher in high-growth firms than in low-growth firms. To the extent that benefits from signaling are greater when information asymmetry is high, high-tech firms are more likely to use discretionary accruals to convey private information, to signal future opportunities for growth, and to help bridge the information gap between managers and shareholders. The information environment is complex in high-tech firms, and investors must infer true earnings from reported accounting earnings because they cannot easily observe true economic earnings. Chief executive officers in high-tech firms thus have incentives to use discretionary accruals to influence investor perception of firm value.

Questions also arise regarding whether the lesser value relevance of financial information of high-tech firms is explained by this greater level of earnings management. The period of the 1990s is frequently quoted in the press as the one characterized by the irrational exuberance of U.S. stock markets and the formation of record budget surpluses from government tax revenues. During this period, most high-tech firms were able to accumulate large amounts of capital in the financial market regardless of the size of earnings (losses) reported in their income statements because of their enormous opportunities for growth and favored status in the technology-based New Economy. Therefore, differential value relevance of accounting earnings, changes in accounting earnings, sales, and changes in sales between two sectors is likely to persist even when the level of earnings management is controlled for.

Based on the above arguments, we posit that the differences in the value-relevance of financial information between high-tech and low-tech firms remain intact even after controlling for the earnings management effect. Thus, following hypotheses are constructed in their alternate forms with respect to the size of earnings management and a joint experiment of value-relevance and earnings management:

H3: High-tech firms will engage in higher levels of earnings management than low-tech firms.

H4: High-tech firms will show a lesser association of market-adjusted returns with earnings, change in earnings, sales, and change in

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[8] Francis and Schipper (1999) implement two different approaches – hedge portfolios and adjusted R^2 form regressions – to gauge the value-relevance of accounting information. In the hedge portfolio analysis, they find significant difference in its relevance between high-tech and low-tech firms only in one out of five portfolio groups (change in cash flows) although the numbers of the relevance measure are consistently lower in high-tech firms than in low-tech firms. In contrast, in their explanatory power tests, the numbers of the adjusted R^2 measure are considerably lower at the 1% level for high-tech firms than for low-tech firms in balance sheet and book value & earnings relations. However, their primary research focus is on the temporal difference of the value-relevance of financial statements of all firms, not the cross-sectional difference between high- and low-tech firms.

[9] Business Week article (March 18, 2002), titled "The Surprise Economy," observes: "The growing importance of ***technology*** means that this is no ordinary capital-spending cycle. Typically, business outlays lag behind the upturn in the economy as companies wait for firm evidence that future demand will justify additions to production capacity. But this time, businesses are buying new tech gear not so much to add to capacity but to enhance productivity in an effort to cut costs and restore profit margins," … "After getting burned by pie-in-the-sky forecasts of the late-1990s tech boom, CEOs and some investors remain exceptionally skittish about betting on the future. But if there is anything we have learned in recent years, it is that the U.S. economy's improved ***efficiency***, ***flexibility***, and ***quick reflexes*** have given it a surprising resiliency. ***The New Economy*** has shown time and again that it can deliver on its promises. This year may well be another one of those times." It seems to be obvious that the business community contrasts the New Economy and the Old Economy in terms of improved ***efficiency***, ***flexibility***, and ***quick reflexes*** resulting from investment in cutting-edge high-tech products.

sales than low-tech firms even after the level of earnings management is controlled for.

3. Samples and Research Design
3.1 Samples and Descriptive Statistics

As shown in Table 1-A, in order to enhance the generality of this study's findings, we combine the technology firms from CNNFN.COM (as of July 20, 2000) with the list of high-tech firms defined by Francis and Schipper (1999) to form this study's sample of high-tech firms (HTC), which is also consistent with the high-tech sample examined in Kwon (2002). CNNFN.COM is one of the most widely-visited Internet sites for business news, and thus provides the initial sample of 162 tech stocks. After adjusting for companies that are included in more than one category and whose CUSIPs are not in the 1999 COMPUSTAT file, the CNN sample decreases to 135 firms. Upon the addition of the 22 companies that belong to only the CNN sample, the HTC sample increases to 2,728 firms. The LTC sample of 984 firms is similarly obtained from Francis and Schipper (1999).

The main factors that can be used to distinguish between high-tech and low-tech samples are the prevalence of intangible assets and the importance of future growth opportunities. The high-tech firms are known to have significant unrecorded intangible assets and high levels of growth opportunities (Smith and Watts, 1992; Gaver and Gaver, 1995). Several recent papers that adopt this definition of high-tech firms are Francis and Schipper (1999), Givoly and Hayn (2000), and Core et al. (2003).

The three-digit SIC codes for all three samples are shown in Table 1. The three industries that contain more than 60% of HTC firms are computer and data processing services, drugs, and computer and office equipment (computer and data processing services, electronic components and accessories, and computer and office equipment). It is interesting to note that the drugs industry, which ranks second highest with 453 firms in the HTC sample, does not appear at all in the CNN sample. The three most conspicuous industries in the LTC sample are motor vehicles and equipment, paper and allied products, and miscellaneous plastics products.

[Insert Table 1 here]

Table 2 shows fifteen median financial ratios/variables of high-tech and low-tech firms with information on the statistical differences between the two samples. The significance levels based on the two-tailed Wilcoxon Z test statistics are indicated by an asterisk. As widely expected, the high-tech firms generally have lower per-share earnings and cash flow from operations (each deflated by share price at fiscal year-end) than low-tech firms. Consistent with the per-share earnings information, high-tech firms exhibit higher market-to-book ratio (a proxy for unrecognized intangible assets) and market-to-book value of assets (a proxy for a firm's investment opportunity set [IOS]) than low-tech firms.[10] As pointed out in Givoly and Hayn (2000, p.314), market-to-book ratios as well as earnings multiples (the opposite of per-share earnings divided by share price) tend to be higher when accounting measurement is more conservative, given the investors' use of the present value of future cash flows as a basis for their equity valuation.

However, as indicated in the introduction, higher market-to-book ratios and earnings multiples may also signify both an omission of value-relevant intangibles from a firm's balance sheet and a premature recognition of expenses on the income statement, and more conservative accounting for high-tech firms. Thus, it is worthwhile to examine together both value-relevance and conservatism issues for the sake of analyzing the differences between high- and low-tech firms in their entirety.

Consistent with Amir and Lev (1996, table2), high-tech firms reveal, as signs of more conservative accounting, higher levels of sales and administrative expenses deflated by net sales, depreciation expenses deflated by plant assets, and amortization expenses deflated by plant assets than low-tech firms. In other words, high-tech companies spend more on brand development and customer acquisition, and recognize rapid depreciation of fixed assets,

Also, high-tech firms expend considerably more on R&D activities. The average ratio of R&D expenses relative to total assets (a proxy for investments in unrecorded intangible assets) across the sample period (1990-98) is 0.094 for HTC, compared to 0.012 for LTC. These statistics are comparable to those of Francis and Schipper (1999, p.343), who find that the average ratios of R&D expenses over 1952-94, deflated by total assets, are 0.092 and 0.008 for HTC and LTC, respectively.

Consistent with contracting hypotheses set forth in Myers (1977), and Smith and Watts (1992), high-tech firms reveal significantly lower leverage (measured in debt-to-asset ratio) than low-tech firms.[11] The more negative free cash flows and special items for high-tech firms may imply more investments in technology products, a greater write-down or write-off of inventories and plant assets, and more spending on restructuring/reorganization activities.[12]

[10] Francis and Schipper (1999, p.342) indicate that market-to-book ratios have been used in prior research as a proxy for unrecognized intangible assets. Market-to-book value of total assets as a component of IOS is shown in Krishnan and Kumar (2001) and Kwon and Yin (2006).

[11] Under the contracting argument, firms with more growth options (this paper's high-tech sample) have less debt because of the more severe incentive problems associated with debt [Smith and Watts (1992, p.278) and Myers (1977)].

[12] More free cash flow for low-tech firms is consistent with predictions of prior research. Jensen (1986) indicates that firms with more free cash flow (this paper's low-tech sample) opt for higher levels of leverage in their capital

In general, high-tech firms are smaller than low-tech firms when firm size is measured by total assets, sales, or market value of equity. The size of HTC firms is on average two thirds of the average size of the LTC firms according to 1998 data. A common measure of the information environment is firm size (e.g., Atiase 1985; Collins et al. 1987; Freeman 1987; Wild and Kwon 1994). In particular, it is maintained that the benefits rewarded to market participants for engaging in information search activities are increasing in firm size and, consequently, larger firms' prices are expected to impound relatively more information and to assimilate it faster than smaller firms (Kwon and Wild 1994, p.345).

As demonstrated in Atiase (1985), Freeman (1987), and Grant (1980), there exists an inverse relation between firm size and the strength of reactions/associations between unexpected annual earnings and contemporaneous security price changes, ceteris paribus. Therefore, this inverse relation works against finding evidence consistent with this paper's hypotheses 1 and 2 that low-tech firms (larger firms) are predicted to have stronger price reaction and association with earnings, changes in earnings, sales, and changes in sales than high-tech firms (smaller firms). Consequently, the evidence, if any, of differential value relevance between high-tech and low-tech firms under this situation can become even more convincing.

[Insert Table 2 here]

3.1 Research Design

3.1.1 Value-Relevance of Financial Statements Data

A. Short-Window Reaction Tests

Using all available data, we estimate the following regression from pooled cross-sectional data over the 9-year period 1990-1998:

$CAR_{it} = \alpha_0 + \alpha_1 EPS_{it}/P_{t-1} + \alpha_2 \Delta EPS_{it}/P_{t-1} + \Sigma\beta_i IND_I + \Sigma\beta_j YEAR_j + u_{it}$ (1)

where:

CAR_{it} = cumulative abnormal returns, obtained from the market model which regresses return on security i on the CRSP value-weighted NYSE/AMEX index, over two alternative periods: (i) a two-day window around year t earnings announcement (day[-1] thru day[0], in which day[0] is the announcement day) and (ii) a three-day window centered on the annual earnings announcement. The earnings announcement dates are obtained from the 1999 quarterly COMPUSTAT file. The return data are available from the 1999 Daily CRSP file.

EPS_{it}/P_{t-1} = basic earnings per share before extraordinary items divided by share price at the beginning of fiscal year-end.

$\Delta EPS_{it}/P_{t-1}$ = the change in basic earnings per share divided by share price at the beginning of fiscal year-end. These independent variables are adjusted for stock splits and stock dividends.

INDi = two-digit SIC codes.

= 1 if the firm is in industry i and 0 otherwise.

YEARj = 1 if the firm is in Year j and 0 otherwise.

The pooled cross-sectional regression models also include eight-year dummy variables for 1990 through 1997, and eight and fifteen industry dummy variables representing two-digit SIC code numbers for the HTC and LTC firms, respectively. These dummy variables are expected to capture industry-specific and time-specific factors. All t-statistics are subjected to White's (1980) heteroscedasticity correction.

B. Long-Window Association Tests

My second approach to measuring value-relevance is similar to that adopted in Francis and Schipper (1999). They examine three contemporaneous relations between market value measures and accounting variables: earnings, balance sheet, and book value & earnings relation. As shown in short-window reaction models, industry- and time-dummy variables are added. Specifically, we estimate the following regressions for the pooled data over the 1990-1998 period:

$CMAR_{i,t} = a_{0,t} + a_{1,t} INC_{i,t} + a_{2,t} \Delta INC_{i,t} + \Sigma\beta_i IND_I + \Sigma\beta_j YEAR_j + v_{i,t}$ (Earnings Relation) (2)

$MV_{i,t} = b_{0,t} + b_{1,t} ASSET_{i,t} + b_{2,t} LIAB_{i,t} + \Sigma\beta_i IND_I + \Sigma\beta_j YEAR_j + w_{i,t}$ (Balance Sheet Relation) (3)

$MV_{i,t} = c_{0,t} + c_{1,t} BV_{i,t} + c_{2,t} INC_{i,t} + \Sigma\beta_i IND_I + \Sigma\beta_j YEAR_j + \gamma_{i,t}$ (Book Value & Earning Relation) (4)

where:

$CMAR_{i,t}$ = cumulative market-adjusted return (a firm's return *minus* equally-weighted market return) on security i over the 15-month period ending 3 months following the end of fiscal year t and the return data available from the 1999 Monthly CRSP file;

$INC_{i,t}$ = firm i's income before extraordinary items in year t divided by the market value of equity at the beginning of year t;

$\Delta INC_{i,t}$ = firm i's income before extraordinary items in year t minus its income in year t-1 divided by the market value of equity at the beginning of fiscal year t;

$MV_{i,t}$ = the per share market value of firm i's equity securities at the end of fiscal year t;

$ASSET_{i,t}$ ($LIAB)_{i,t}$ = the per share book value of firm i's assets (liabilities) at the end of fiscal year t;

$BV_{i,t}$ = the per share book value of equity for firm i at the end of fiscal year t;

INDi = two-digit SIC codes ;

= 1 if the firm is in industry i and 0 otherwise; and

YEARj = 1 if the firm is in Year j and 0 otherwise.

If high-tech firms' financial statements are more susceptible to the omission of intangibles or the overcharge of expenses than low-tech firms, these three relations, measured in terms of the significance of coefficients and adjusted R^2, between cumulative market-adjusted returns and primary accounting variables are expected to appear weaker for high-tech firms than for low-tech firms.

structure as a credible precommitment to pay out the excess cash.

3.1.2 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.[13] For every year t from 1992 to 1998, the following model is estimated:

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

where, for firm i at time t,

$TACCR_{i,t}$ = total accruals, see footnote[14];
$A_{i,t-1}$ = 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 (3) for the years 1992-98:

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

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.

4. Empirical Results

4.1 Results from Value-Relevance Tests

Short-Window [15]

The results from the two-day return window reported in panel A of Table 3 are generally consistent with the first hypothesis that high-tech firms show a smaller reaction of firm-specific returns to earnings and change in earnings than low-tech firms around earnings announcement. The t-statistic for per share change in earnings is 3.35, significant at the 0.01 level for low-tech firms whereas none of the coefficients for high-tech firms are statistically material. In addition, the adjusted R^2 (0.0145) of low-tech firms is more than three times higher than that (0.0046) of high-tech firms.

The results of Table 3 are more credible in light (5)
of the fact that high-tech firms have shown to be significantly smaller in this study and thus are expected to have a stronger earnings surprise than low-tech firms, ceteris paribus. Accordingly, it can be concluded that the size effect hypothesis, documented by Grant (1980), Atiase (1985, 1987), Bamber (1987), and Freeman (1987), reinforces the significance of short-window based results and fails to serve as a competing hypothesis with this paper's first hypothesis. [16]

Recently, Hayn (1995) suggests that pooling profitable and loss observations in samples used by researchers to estimate the information content of earnings and/or the change in earnings leads to a (6)
downward bias in coefficients and return-earnings association. Indeed, in Panels B and C of Table 3,we find a more significant reaction of stock returns only in positive earnings cases, but none is even marginally significant in negative earnings cases, thus confirming such expectations expressed in Hayn (1995).

[Insert Table 3 here]

Long-Window

The empirical evidence of Tables 4 suggests that there is a significantly weaker earnings relation for HTC firms than for LTC firms. The t-statistics for INC and ΔINC are 2.99 (9.53) and 0.13 (7.68) for high-tech (low-tech) firms, respectively. Moreover, the adjusted R^2 (0.110) for low-tech firms is more than twenty-seven times higher than that (0.004) for high-tech firms. However, the relations of balance sheet and book value & earnings are indistinguishable between the two sectors. The indistinct evidence of balance sheet and book value & earnings relations is consistent with the theoretical prediction of Zhang (2000). He concludes that under conservative

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[13] 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.

[14] $TACCR_{i,t} = \Delta CA_{i,t} - \Delta CL_{i,t} - \Delta Cash_{i,t} + \Delta STD_{i,t} - Dep_{i,t}$, 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).

[15] We choose only a very short event window, that is, a two-day window because the longer the window is, the higher the potential in which more confounding events, like dividends, mergers & acquisitions, the award of government contracts, restructuring, reorganization, considerable capital investments in technology products, etc., mitigate the earnings announcement effect.

[16] The inclusion of a logarithmic form of total assets in the regression model in order to control for the size effect resulted in qualitatively similar results.

accounting, firm growth plays an important role in combining book value and earnings in equity valuation.

[Insert Table 4 here]

Table 5 compares the mean annual adjusted R^2 from year-by-year raw and rank regressions over the sample period (1990-1998) between high- and low-tech firms in both short- and long-window analyses.[17] Consistent with results from Tables 3 & 4, high-tech firms show a significantly weaker relation only in earnings cases, but not in other relation cases in both raw and rank regressions with an exception of the short-window rank regression analysis in which the t-value is –0.8. All other t-statistics are reliably significant at 1%. In general, evidence from Tables 3, 4 and 5 confirms the first and second hypotheses in that low-tech firms show a stronger reaction/association between the market-adjusted returns and financial information variables than high-tech firms. Here again, the size effect hypothesis strengthens the significance of short- and long-window based results

[Insert Table 5 here]

4.2 Results from Joint Test of Value Relevance and the Size of Earnings Management

Table 6 presents the results for the differences between high-tech and low-tech firms in signed and unsigned discretionary accruals using both the modified Jones model (Panel A) and the performance-matched model (Panel B). The table shows the mean and median discretionary accruals for firm-year data pooled over the sample period of 1990-1998. It is interesting to observe that the differences in both signed and unsigned accruals are, in general, statistically significant at 1% levels in two-tailed parametric and non-parametric tests under both models of discretionary accruals. The results of greater levels of earnings management for high-tech firms than for low-tech firms are consistent with the argument that high-tech firms are more likely to use discretionary accruals to meet earnings forecasts, supporting H3. In addition, the evidence of greater use of income-decreasing methods for high-tech firms is consistent with the results of Kwon, Yin, and Han (2006).[18]

[Insert Table 6 here]

The results of Table 7 provide insight into the differential value relevance of key accounting information such as earnings, changes in earnings, sales, and changes in sales between high-tech and low-tech firms, after controlling for the earnings management effect measured by performance-matched discretionary accruals.[19] The regression model in Panel A is an extension of equation (2). In other words, the only difference between equations (2) and (7) is the earnings management proxy (performance-matched discretionary accruals) variable which is added to regression model (2), resulting in model (7) in Panel A. Since sales or changes in sales reflect the growth in customer base, these variables probably are more important than earnings for high-tech firms vis-à-vis low-tech firms. Therefore, these variables are also added to equation (7) in order to construct regression model (8) in Panel B.

The signs of variables are consistent with predicted ones in both Panels with the exception of the coefficients on sales for both high-tech and low-tech firms. The coefficients for the absolute value of the PMDA (a proxy for the size of earnings management) variable are all positive, but insignificant in both high-tech and low-tech firms, supporting a positive (though negligible) role of earnings management in signaling management's inside information on the future earning power of a firm.

Specifically, the results of Panels A & B of Table 7 reveal that income and changes in income in both high-tech and low-tech firms are important information variables for the valuation of a firm, consistent with the results of a seminal paper by Ball and Brown (1968). The levels of significance are for the most part at 1 % in two-tailed t-statistics. Also, changes in sales turn out to be a more meaningful measure (t=2.82, significant at the 1% level) than sales in explaining variations of stock returns in high-tech industries.

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[17] Francis and Schipper (1999) indicate the benefits of using the rank regression relative to the raw (OLS) regression: (i) the rank regression allows for unspecified nonlinearities in the relation between the dependent and independent variables, and (ii) it eliminates the influence of outliers because it uses only ranks of variables. The empirical evidence in Beaver et al. (1979), Freeman and Tse (1992) and Das and Lev (1994), and the theoretical support for such evidence in Subramanyam (1996) all suggest that the returns-earnings relation is nonlinear with the average price response declining in the absolute magnitude of surprise.

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

[19] We replicated the tests using discretionary accruals based upon the modified Jones model and obtained qualitatively similar results.

The adjusted R^2 value for low-tech firms is 2.86 (2.75) times higher than that of high-tech firms in Panel A (B). These results are consistent with this paper's fourth hypothesis (H4) that the value-relevance of financial information for low-tech firms is greater than that for high-tech firms even after controlling for the earnings management effect. The fitness of valuation model, represented by F-value, is 6.11 (5.88) for HTC and 13.81 (13.12) for LTC firms in Panel A (B), which also supports a stronger relation between financial information and security price (a proxy measuring the value-relevance of financial information) for low-tech firms relative to high-tech firms.

[Insert Table 7 here]

5. Extreme Value Treatment

In all analyses concerning value-relevance tests and earnings management tests, several different methods of truncation are used: a deletion of observations outside mean ± 3std, mean ± 4std , mean ± 5std; a deletion of an extreme 1 % of sample observations; and a deletion of an extreme 2 % of sample observations. The results presented in Tables 3-7 are robust to such alternative treatments.

6. Summary and Conclusions

This paper examines the value-relevance of primary accounting information and earnings management concurrently for high-tech versus low-tech firms. Relying on the recent development in theoretical models and empirical measures of value-relevance and earnings management, it elaborates on four hypotheses related to these issues and provides evidence consistent with them. In particular, this study adopts a broader definition of high-tech firms in order to enhance the generality of the findings extracted from high-tech firms: CNN firms (practitioners' definition) and HTC firms (academicians' definition).

Specifically, the findings in this paper concerning the aforementioned four hypotheses can be summarized as follows: First, high-tech firms reveal a smaller reaction of firm-specific returns to earnings and change in earnings than low-tech firms around earnings announcements. In addition, consistent with Hayn (1995), such reactions or differences in reactions of firm-specific returns are limited to only positive earning cases. Second, high-tech firms reveal a weaker relation between the market-adjusted returns and primary accounting information including earnings and changes in earnings than low-tech firms. These value-relevance results become even more justified in light of the reverse predictions from firm-size hypothesis resulting from the smaller size of high-tech firms.

As predicted, the size of earnings management measured by modified Jones discretionary accruals and performance-matched discretionary accruals is greater for high-tech firms vis-à-vis low-tech firms over the sample period. More importantly, this paper also looks into the value-relevance of financial information and earnings management simultaneously in regression models and finds that the association between cumulative adjusted returns and key financial variables, including earnings, changes in earnings, sales, and changes in sales, is still weaker for high-tech firms than for low-tech firms even after earnings management effects have been placed under control. Numerous previous studies have examined the inter-temporal properties of financial numbers, including both value relevance and levels of earnings management. However, to our knowledge, this study is the first to investigate both issues – value relevance of financial information and earnings management – concurrently from a cross-sectional perspective in a uniquely contrasted setting of New Economy (high-tech) and Old Economy (low-tech) firms for the period of the 1990s, a decade characterized by the dawn of the Information Age furnished with the Internet. In conclusion, the results of this paper shed light on the importance of approaching the issue of differential value-relevance in connection to the issue of differential levels of earnings management between high- and low-tech firms in order to better explain seemingly overpriced stocks reflected in the New Economy.

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Appendices

Table 1. Three-Digit SIC Codes of High-Tech and Low-Tech Samples

Sample	3-digit SIC codes	Industry	Number of firms
Panel A: High-Tech Firms (HTC)			
	272	Periodicals	1
	283	Drugs	453
	355	Special Industry Machinery	2
	357	Computer and Office Equipment	314
	360	Electronic & Other Electric Equipment	5
	361	Electric Distribution Equipment	11
	362	Electrical Industrial Apparatus	39
	363	Household Appliances	24
	364	Electric Lighting and Wiring Equipment	38
	365	Household Audio and Video Equipment	45
	366	Communications Equipment	255
	367	Electronic Components and Accessories	253
	369	Misc. Electrical Equipment & Supplies	47
	381	Search and Navigation Equipment	1
	382	Measuring and Controlling Devices	1
	386	Photographic Equipment and Supplies	1
	481	Telephone Communications	245
	484	Cable and Other Pay TV Services	6
	489	Communications Services, NEC	2
	573	Radio, TV, & Electronic Stores	3
	596	Nonstore Retailers	1
	621	Security Brokers and Dealers	1
	679	Misc. Investing	1
	733	Mailing, Reproduction, Stenographic	1
	737	Computer and Data Processing Services	907
	738	Misc. Business Services	1
	873	Research and Testing Services	70
		Total	2,728
Panel B: Low-Tech Firms (LTC)			
	020	Agricultural Production - Livestock	7
	160	Heavy Construction, Excluding Building	38
	170	Special Trade Contractors	39
	202	Dairy Products	17
	220	Textile Mill Products	62
	240	Lumber and Wood Products	33
	245	Wood Buildings and Mobile Homes	22
	260	Paper and Allied Products	103
	300	Rubber and Misc. Plastics Products	32
	308	Misc. Plastics Products	80
	324	Cement, Hydraulic	8
	331	Blast Furnace and Basic Steel Products	75
	356	General Industrial Machinery and Equip.	79
	371	Motor Vehicles and Equipment	120
	399	Misc. Manufacturing Industries	31
	401	Railroads	22
	421	Trucking & Courier Services	67
	440	Water Transportation	34
	451	Scheduled Air Transportation	52
	541	Grocery Stores	63
		Total	984

Table 2. Median Financial Ratios of high-tech and low-tech companies

Variable	Sample	1990	1991	1992	1993	1994	1995	1996	1997	1998
1. EPS/PFYE										
	HTC	0.027**	0.025**	0.026**	0.019**	0.027**	0.014**	0.008**	0.002**	-0.007**
	LTC	0.059	0.040	0.043	0.043	0.061	0.058	0.052	0.049	0.055
2. CFO/PFYE										
	HTC	0.070**	0.057**	0.042**	0.029**	0.033**	0.020**	0.013**	0.013**	0.013**
	LTC	0.127	0.102	0.093	0.081	0.088	0.097	0.099	0.079	0.104
3. Market-to-Book										
	HTC	1.449	2.070*	2.407**	2.798**	1.982**	3.218**	2.938**	2.865**	2.527**
	LTC	1.272	1.640	1.902	2.088	1.832	1.687	1.875	1.964	1.770
4. SGA/Sales										
	HTC	0.352**	0.358**	0.358**	0.370**	0.374**	0.383**	0.421**	0.433**	0.453**
	LTC	0.201	0.192	0.200	0.188	0.178	0.182	0.185	0.187	0.188
5. Depn/PPE										
	HTC	0.108**	0.105**	0.110**	0.115**	0.123**	0.123**	0.128**	0.135**	0.143**
	LTC	0.069	0.070	0.070	0.069	0.071	0.071	0.071	0.071	0.071
6. Depn & Amtn /PPE										
	HTC	0.114**	0.114**	0.118**	0.122**	0.131**	0.130**	0.138**	0.142**	0.154**
	LTC	0.072	0.072	0.072	0.072	0.074	0.073	0.073	0.074	0.074
7. Debt/Asset										
	HTC	0.144**	0.117**	0.102**	0.080**	0.070**	0.066**	0.050**	0.052**	0.067**
	LTC	0.257	0.237	0.260	0.227	0.228	0.225	0.232	0.236	0.264
8. FCF/PFYE										
	HTC	-0.001	-0.001**	-0.017**	-0.027**	-0.024**	-0.024**	-0.034**	-0.032**	-0.039**
	LTC	0.019	0.028	0.018	0.004	0.000	-0.008	0.003	-0.002	-0.006
9. SPEC/Sales[b]										
	HTC	-0.040	-0.046	-0.066	-0.052**	-0.046**	-0.044	-0.082**	-0.106**	-0.053**
	LTC	-0.357	0.078	-0.007	-0.015	-0.022	-0.021	-0.010	0.054	0.146
10. R&D/Asset										
	HTC	0.084**	0.082**	0.089**	0.087**	0.093**	0.089**	0.099**	0.109**	0.115**
	LTC	0.013	0.015	0.014	0.012	0.011	0.011	0.011	0.011	0.013
11. Market-to-Book Value of Asset										
	HTC	1.298*	1.653*	1.905**	2.088**	2.513**	2.415**	2.303**	2.258**	2.036**
	LTC	1.161	1.317	1.373	1.536	1.369	1.358	1.416	1.456	1.364
12. ROA										
	HTC	0.000**	0.000**	0.002**	0.000**	0.001**	0.001**	0.000**	-0.003**	-0.008**
	LTC	0.039	0.028	0.038	0.043	0.050	0.052	0.050	0.046	0.044

Table 2(continued)

Variable[a]	Sample	1990	1991	1992	1993	1994	1995	1996	1997	1998
13. Asset										
	HTC	34.0**	37.2**	42.5**	40.7**	41.3**	43.1**	43.1**	46.8**	59.5**
	LTC	122.9	135.1	140.1	166.3	170.2	180.3	197.3	229.4	229.3
14. Sales										
	HTC	38.4**	40.2**	44.9**	40.9**	41.2**	37.3**	38.5**	43.9**	51.6**
	LTC	169.4	196.4	211.1	260.5	270.1	257.5	270.9	317.1	317.8
15. Market Value of Equity										
	HTC	27.8**	45.9**	64.5**	69.8**	68.3**	99.7	86.3**	89.5**	88.1*
	LTC	62.8	121.5	125.0	157.1	147.2	120.9	131.0	153.9	135.6

[a] The definitions of these variables are given below with annual COMPUSTAT items in parentheses: EPS/PFYE = primary earnings per share before extraordinary items (58) divided by share price at fiscal year-end (199), CFO/PFYE = net cash flow from operating activities per-share (308/54) divided by share price at fiscal year-end (199), Market-to-Book = share price at fiscal year-end (199) divided by book value of equity per share (60/25), SGA/Sales = selling, general, and administration expenses (189) divided by net sales (12), Depn/PPE = depreciation expenses (14 – 65) divided by gross property, plant, and equipment (7), Depn & Amtn /PPE = depreciation and amortization expenses (14) divided by gross property, plant, and equipment (7), Debt /Asset = long-term debt plus the current portion of long-term debt (9 + 34) divided by total assets (6), FCF/PFYE = free cash flows per share (308 + 311) / 54 divided by share value at fiscal year-end (199), SPEC/Sales = special items (17) divided by net sales (12), R&D/Asset = Research and Development expenses (46) divided by total assets (6), Market-to-Book value of asset = market value of total assets (6 – 60 + 199 * 25) divided by book value of total assets (6), ROA = income before extraordinary items (18) divided by total assets (6), Assets = total assets (6), Sales = net sales (12) , and Market Value of Equity = common shares outstanding (25) multiplied by share price at fiscal year-end (199). Wilcoxon Rank-Sum tests are performed between HTC and LTC. The symbols of * and ** indicate statistical significance levels of 5% and 1%, respectively, in two-tailed tests.

[b] Mean values are reported since median values are close to zero when measured in million dollars.

Table 3. Short-Window (Two-Day) Returns Regression
Reaction of Abnormal Returns to Earnings and Earnings Changes
1990-1998[a]

Panel A: All Earnings	EPSt/Pt-1	ΔEPSt/Pt-1	Adj. R^2 (R^2)	F-Value	N
HTC	0.0029(1.88)[w]	0.0009(0.62)[w]	0.0046(0.0075)	2.572 (0.00)**	5,807
LTC	0.0030(0.08)	0.1425(3.35)**	0.0145(0.0293)	1.981 (0.00)**	1,613

Panel B: Positive Earnings	EPSt/Pt-1	ΔEPSt/Pt-1	Adj. R^2 (R^2)	F-Value	%
HTC	0.0070(2.88)**	0.0015(0.61)	0.0147(0.0196)	4.020 (0.00)**	59.2
LTC	0.1004(3.14)**	0.1223(2.52)**	0.0216(0.0395)	2.204 (0.00)**	81.3

Panel C: Negative Earnings	EPSt/Pt-1	ΔEPSt/Pt-1	Adj. R^2 (R^2)	F-Value	%
HTC	-0.0002(-0.12)	0.0013(0.68)	-0.0026(0.0041)	0.616 (0.78)	40.8
LTC	-0.0193(-0.28)	0.0993(1.39)	-0.0122(0.0623)	0.837 (0.73)	18.7

[a] Short return windows include a two-day (day –1 and 0) cumulation period, where day 0 is the earnings announcement day according to the 1999 quarterly COMPUSTAT file. The dependent variable is cumulative abnormal returns obtained from the market model which regresses return on security i on the CRSP value-weighted NYSE/AMEX index. EPSt/Pt-1 = basic earnings per share before extraordinary items divided by share price at the beginning of fiscal year-end and ΔEPSt/Pt-1 = change in basic earnings per share divided by share price at the beginning of fiscal year-end These independent variables are adjusted for stock splits and stock dividends. The pooled sample models include eight year dummy variables for 1990 through 1997, and eight and fifteen industry dummy variables representing two-digit SIC code numbers for HTC and LTC, respectively. The symbols of * and ** indicate statistical significance levels of 5% and 1%, respectively, in two-tailed tests. Whenever a violation occurs with respect to assumptions of homoskedastic errors, independence between the errors and regressors, and the linear specification of the model, White's (1980) heteroscedasticity-consistent t-statistics are reported.

Table 4. Long-Window Returns Regression
Association of Market-Adjusted Returns with Financial Statement Variables
1990-1998[a]

Panel A: Earnings Relation

Sample	INC	ΔINC	Adj. R^2 (R^2)	F-Value	N
HTC	0.024(2.99 [w])**	0.001(0.13[w])	0.004(0.008)	1.956(0.01)**	4,264
LTC	0.067(9.53 [w])**	0.066(7.68 [w])**	0.110(0.120)	13.498(0.00)**	2,750

Panel B: Balance Sheet Relation

Sample	ASSET	LIAB	Adj. R^2 (R^2)	F-Value	N
HTC	2.195(23.38[w])**	-1.540(-15.51[w])**	0.500(0.500)	239.753(0.00)**	4,264
LTC	2.809(21.75[w])**	-2.347(-16.05 [w])**	0.520(0.530)	112.807(0.00)**	2,750

Panel C: Book Value & Earnings Relation

Sample	BVS	INC	Adj. R^2 (R^2)	F-Value	N
HTC	0.849(29.83[w])**	0.185(5.91[w])**	0.500(0.500)	237.988(0.00)**	4,264
LTC	0.639(30.14[w])**	0.103(5.68[w])**	0.520(0.520)	111.155(0.00)**	2,750

[a] The dependent variable for both earnings and cash flow relation is cumulative market-adjusted return on security i over the 15-month period ending 3 months following the end of fiscal year t. INC = firm i's income before extraordinary items in year t divided by the market value of equity at the beginning of year t; ΔINC = firm i's income before extraordinary items in year t

minus its income in year t-1 divided by the market value of equity at the beginning of fiscal year t. The dependent variable for both balance sheet and book value & earnings relation is the per share market value of firm i's equity securities at the end of fiscal year t. ASSET (LIAB) = the per share book value of firm i's assets (liabilities) at the end of fiscal year t and BVS = the per share book value of equity for firm i at the end of fiscal year t. The pooled sample models include eight year dummy variables for 1990 through 1997, and eight and fifteen industry dummy variables representing two-digit SIC code numbers for HTC and LTC, respectively. The symbols of * and ** indicate statistical significance levels of 5% and 1%, respectively, in two-tailed tests. Whenever a violation occurs with respect to assumptions of homoskedastic errors, independence between the errors and regressors, and the linear specification of the model, White's (1980) heteroscedasticity-consistent t-statistics are reported.

Table 5. Comparison of Mean Annual Adjusted R^2 between High-Tech and Low-Tech companies From Year-by-Year Regressions [a]

Panel A: Mean Annual Adjusted R^2 from Raw Regression Results (1990-1998)

	Short-Window	Long-Window		
Sample	Earnings Reaction	Earnings Relation	Balance Sheet Relation	Book Value & Earning Relation
HTC	0.015	0.020	0.519	0.516
(Wilcoxon Z)	(-2.30)**	(-3.53)**	(0.13)	(0.62)
LTC	0.054	0.204	0.527	0.510

Panel B: Mean-Annual Adjusted R^2 from Rank Regression Results (1990-1998)

	Short-Window	Long-Window		
Sample	Earnings Reaction	Earnings Relation	Balance Sheet Relation	Book Value & Earning Relation
HTC	0.008	0.180	0.597	0.581
(Wilcoxon Z)	(-0.80)	(-2.43)**	(3.54)**	(-0.27)
LTC	0.015	0.256	0.537	0.583

[a] The symbols of * and ** indicate statistical significance levels of 5% and 1%, respectively, in one-tailed tests. Wilcoxon rank-sum tests are conducted to determine whether the nine-year average Adjusted R^2 of HTC is significantly smaller than that of LTC.

Table 6. Modified Jones Discretionary Accruals (DA) and Performance-Matched Discretionary Accruals (PMDA) 1990-1998

	HTC (N=1187)		*LTC* (N=1127)		*Comparison*	
	Mean	Median	Mean	Median	Wilcoxon Z (P-Value)	Student's T (P-Value)
Panel A: Modified Jones Discretionary Accruals (DA)						
1. |DA|	0.2360	0.0754	0.1273	0.0428	2.95 (0.01)**	9.89 (0.00)**
2. DA	-0.0233	0.0006	0.0540	0.0048	-2.06 (0.04)*	-2.48 (0.01)**
Panel B: Performance-Matched Discretionary Accruals (PMDA)						
1. |PMDA|	0.3835	0.1155	0.2081	0.0693	3.77 (0.00)**	9.58 (0.00)**

2. PMDA					
-0.1274	-0.0166	-0.0055	-0.0051	-2.53 (0.01)**	-2.20 (0.03)*

[a] Wilcoxon rank-sum and t tests are performed between the HTC and LTC firms. The symbols of * and ** indicate statistical significance levels of 5% and 1%, respectively, in two-tailed tests (LTC ≠ HTC). We lost a significant number of observations in computing discretionary accruals.

Table 7. Test of Value-Relevance after Controlling for the Size of Earnings Management, 1990-1998[a]

	Predicted Sign	Sample HTC Coefficient(t-statistic)	Sample LTC Coefficient(t-statistic)
Panel A: $CMAR_{i,t} = d_{0,t} + d_{1,t} INC_{i,t} + d_{2,t} \Delta INC_{i,t} + d_{3,t} \lvert PMDA \rvert_{i,t} + \Sigma\beta_i IND_i + \Sigma\beta_j YEAR_j + \eta_{i,t}$ (7)			
Intercept		0.0352 (4.74)**	-0.0583 (-3.00)**
INC	+	0.0653 (2.88)**	0.3001 (9.81)**
ΔINC	+	0.0851 (5.71)**	0.1652 (4.73)**
│PMDA│	+/-	0.0031 (0.39)	0.0297 (1.44)
Adj. R^2		0.0688	0.1966
F-Value (p-value)		6.11 (0.00)**	13.81 (0.00)**
Chi-Square (p-value)		103.97 (0.62)	192.33 (0.16)
Panel B: $CMAR_{i,t} = d_{0,t} + d_{1,t} INC + d_{2,t} \Delta INC_{i,t} + + d_{3t} SALESA_{i,t} + d_{4,t} \Delta SALESA_{i,t} + d_{5,t} \lvert PMDA \rvert_{i,t} + \Sigma\beta_i IND_i + \Sigma\beta_j YEAR_j + \eta_{i,t}$ (8)			
Intercept		0.0354 (4.71)**	-0.0543 (-2.79)**
INC	+	0.0412 (1.66)	0.3175 (6.60)**
ΔINC	+	0.0878 (5.89)**	0.1642 (3.90)**
SALESA	+	-0.0052 (-0.17)	-0.1863 (-2.56)*
ΔSALESA	+	0.0293 (2.82)**	0.0157 (0.49)
│PMDA│	+/-	0.0036 (0.45)	0.0276 (1.23)
Adj. R^2		0.0736	0.2021
F-Value (p-value)		5.88 (0.00)**	13.12 (0.00)**
Chi-Square (p-value)		140.14 (0.64)	267.18 (0.02)*

[a] The dependent variable (CMAR) is cumulative market-adjusted return on security i over the 15-month period ending 3 months following the end of fiscal year t. INC = firm i's income before extraordinary items in year t divided by the market value of equity at the beginning of year t; ΔINC = firm i's income before extraordinary items in year t minus its income in year t-1 divided by the market value of equity at the beginning of fiscal year t; $SALESA_{i,t}$ = firm i's net sales in year t, divided by total assets at the end of year t; and $\Delta SALESA_{i,t}$ = firm i's net sales in year t minus net sales in year t-1, divided by total assets at the end of year t; $\lvert PMDA \rvert_{i,t}$ = the absolute value of performance-matched discretionary accruals deflated by total assets for firm i and year t; INDi = two-digit SIC codes and 1 if the firm is in industry i and 0 otherwise; and YEARj = 1 if the firm is in Year j and 0 otherwise. The pooled sample models include eight year dummy variables for 1990 through 1997, and eight and fifteen industry dummy variables representing two-digit SIC code numbers for HTC and LTC, respectively. The symbols of * and ** indicate statistical significance levels of 5% and 1%, respectively, in two-tailed tests. Whenever a violation occurs with respect to assumptions of homoskedastic errors, independence between the errors and regressors, and the linear specification of the model, White's (1980) heteroscedasticity-consistent t-statistics are reported. The most extreme observations (1%) at either end of the distribution for each variable are excluded.