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The effect of differential accounting conservatism on the "over-valuation" of high-tech firms relative to low-tech firms

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Abstract This paper examines systematic differences in the level of accounting conservatism between high-tech and low-tech firms. Relying on the recent development in theoretical models and empirical measures of conservatism, we investigate conservative accounting practices and earnings management behavior in high-tech and low-tech firms. The results based on comparisons of cumulative nonoperating accruals, regression coefficients from the income timeliness models in Basu (1997), the distribution of earnings, and discretionary accruals between the two groups are consistent with a higher level of accounting conservatism in high-tech firms vis-à-vis low-tech firms. Additional analyses show that the effect of conservatism cannot be used as a defense for the over-valuation of high-tech firms.

Keywords High-tech · Low-tech · Conservatism · Earnings management

1. Introduction

There have been debates on whether stock prices in the late 1990s represent a bubble. One consensus seems to be that high-tech stocks are more overpriced than low-tech stocks. Even several years after the stock market started to decline, most tech stocks are still expensive (Greenberg, 2003; Smith, 2002). Despite these assertions, it is not clear whether or why high-tech firms are more overvalued than low-tech firms.

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Those who contend that high-tech stock prices are more inflated than low-tech stock prices often support their claims by citing the higher price-earnings (P/E) ratios or market-to-book (M/B) ratios (e.g. Cole, et al., 1996; Dreman, 1998; Wyatt, 1996).[1] The P/E ratio seems to be a widely accepted gauge for the appropriateness of market valuation (Campbell and Shiller, 1998; White, 2000). However, these ratios are not unambiguous measures of how much stocks are overpriced. This is because the P/E ratio and the M/B ratio are determined by a combination of accounting earnings and market assessment. By using these ratios as a basis for one's claims for overpricing, one has to assume that high-tech and low-tech firms use the same underlying accounting principles and procedures in measuring accounting earnings and book value.

If this assumption holds, then the differences in the two ratios between high-tech and low-tech firms could only be explained by the discrepancies in the numerators of the ratios—the market assessment. It leads one to wonder what if the denominators of the ratios—accounting earnings and book value of equity, are measured differently between high-tech and low-tech firms. More specifically, what if high-tech firms are more conservative in financial reporting than low-tech firms? If the denominators, earnings and book value of equity, are affected by accounting conservatism, the higher earnings and book value multiples of high-tech firms found in today's stock market may not necessarily indicate overpricing.

Whether or not high-tech firms' earnings are more conservative in comparison to low-tech firms' earnings, however, has not yet been conclusively documented in prior research. On one hand, recent cases involving accounting manipulations by some high-tech firms such as Adelphia, Tyco International, and WorldCom suggest that some high-tech firms are aggressive in reporting their earnings (aggressive accounting). Conceivably, many of the young, fast growing high-tech firms are expected to be under pressure to generate favorable accounting numbers to attract external capital.

On the other hand, high-tech firms have more incentives to engage in conservative accounting reporting than low-tech firms. Current generally accepted accounting principles (GAAP) mandate high-tech firms to be more conservative in accounting reporting. For example, high-tech firms are affected to a greater degree by standards such as SFAS 121 on asset impairments, SFAS 5 on contingencies, and SFAS 2, which requires immediate expensing of most R&D costs. High-tech firms are also more affected by industry-specific standards such as SFAS 86 on software development costs and AICPA SOP 97-2 that requires deferral of certain software revenue.

Higher growth opportunities and increased risk due to volatile stock prices make high-tech firms more vulnerable to shareholder litigation (Francis et al., 1994; Jones and Weingram, 1996; Johnson et al., 2001). About one-third of federal securities law class actions involve tech firms (Grundfest and Perino, 1997). Investors of high-tech firms are more likely to resort to class suits than those of low-tech firms, because they have a greater stake in high-tech stocks and the higher volatility of high-tech stocks is likely to cause investors to experience a large wealth decline at some time. The threat of shareholder litigation increases high-tech managers' incentives to practice conservative accounting. High-tech firms are also more politically sensitive when

[1] As of November 23, 1999, Yahoo had a P/E of 1,382, eBay a P/E of 3,351 and Amazon.com traded at a multiple to revenue of 22.9 (it incurred a loss) and had a market cap of $29.7 billion (Trueman et al., 2000).

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investors lose money from alleged overstated income and net assets and conservative accounting can result to reduce political costs.

Because of technological innovations, high-tech firms are more likely to fund operating activities by raising capital from external investors (Trueman et al., 2000). 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.

Furthermore, 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.[2]

Lastly, the 1990s, our sample period, are characterized by the irrational exuberance in the U.S. stock market and the formation of record budget surpluses from government tax revenues. During this period, high-tech firms with high growth potential are susceptible to economic volatility and therefore have an incentive to be conservative in 'good times' in order to smooth earnings over time.

In this paper, we examine whether the overall financial reporting of high-tech firms is more conservative than that of low-tech firms. The empirical tests focus on four proxies of accounting conservatism adopted in prior literature (e.g. Givoly and Hayn, 2000; Basu, 1997; McNichols, 1988): (1) cumulative negative nonoperating accruals, (2) the slope coefficients from the income timeliness models in Basu, (1997), (3) the skewness of earnings, and (4) the variability of earnings. We also investigate whether high-tech firms are more likely to implement income-decreasing earnings management methods than low-tech firms.

People often perceive high-tech firms to be more aggressive in accounting reporting than low-tech firms. Contrary to this general perception, this study documents a higher level of conservatism in high-tech firms than in low-tech firms across all proxies. The results of the discretionary accruals analysis demonstrate that on average high-tech firms use more income-decreasing discretionary accruals than low-tech firms, at least during the stock market boom period of the 1990s. Additional analyses, however, show that the effect of conservatism cannot be used as a defense for the over-valuation of high-tech firms. The value relevance of key financial information such as earnings, changes in earnings, sales, and changes in sales are higher for low-tech firms, *after* we control for the effect of conservatism.

Besides the finding that high-tech firms are more likely to practice conservative accounting, this paper has four additional contributions to accounting literature. First, although we find that the effect of conservatism cannot close the market valuation gap between high-tech and low-tech firms, our results suggest that high-tech stocks may not be as overpriced as it has been argued after the level of conservative accounting reporting is considered. Since high-tech firms are more likely to use conservative accounting methods than low-tech firms, the traditional measures such as price-earnings

[2] The results of Kwon (2002a) support this explanation. Kwon (2002a) finds that the absolute forecast errors and forecast dispersion are *negatively* related to the number of analysts and market-to-book value of assets.

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ratios or market-to-book ratios cannot effectively measure how much high-tech stocks are overpriced when compared to low-tech stocks.

Second, for the same reason, a direct comparison between high-tech and low-tech firms would not be meaningful without first adjusting the effect of varying degrees of conservatism between high-tech and low-tech firms. Therefore, investors, financial analysts, and regulators should consider the different levels of accounting conservatism between high-tech and low-tech firms to more accurately evaluate them. Indeed, the need for such an adjustment to account for cross-country differences in the degree of conservatism is suggested by researchers of international accounting (Gray, 1980; Joos and Lang, 1994; Harris et al., 1994; Ball et al., 2000; Pope and Walker, 1999; Watts, 2003). Some financial analysts are already making this type of adjustment when comparing financial statements of companies in different countries (French and Poterba, 1991; Speidel and Bavishi, 1992).

Third, the beginning of this paper's sample period almost coincides with the advent in 1991 of the World Wide Web which has turned the Internet into a commercial instrument and whose pervasive use has led to the start of the New Economy. The analysis of differential accounting conservatism between high-tech (New Economy) and low-tech (Old Economy) firms is more meaningful in this study than in previous studies which examine the issue of accounting conservatism for the periods prior to the 1990s.[3]

Fourth, our finding that high-tech firms have higher levels of conservatism as reflected in the greater likelihood to engage in income-decreasing earnings management adds another dimension to the research examining managers' opportunistic behavior in financial reporting.

The remainder of this study is organized as follows: the next section develops the hypothesis. The third section describes the sample and measures of conservatism. The fourth section reports the results of empirical tests. The concluding comments are offered in the final section.

2. Hypotheses development

Conservatism is defined as the differential verifiability required for recognition of profits versus losses (Watts, 2003). Devine (1963) provides a review of various motivations for accounting conservatism and advances three possible explanations: investors have asymmetric loss functions; conservative claims of management may be more easily verified than optimistic claims; and managers may optimistically bias their reports, leading auditors to compensate by being conservative.

The incentives for conservative financial reporting are different between high-tech firms and low-tech firms in the following several areas. First, high-tech firms are affected to a greater degree by standards such as SFAS 121 on asset impairments and SFAS 5 on contingencies, which become operative when negative economic news surfaces. High-tech firms are also more affected by industry-specific standards such as SFAS 86 on software development costs and AICPA SOP 97-2 that requires deferral of

[3] This paper differs from Givoly and Hayn (2000) in that we focus on the direct comparison of the average levels of conservatism between high-tech and low-tech firms, whereas they focus on the general trend of profitability and incidences of losses.

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certain software revenue. SFAS 2, which requires immediate expensing of most R&D costs, has a more direct effect on high-tech firms' earnings (Lev and Zarowin, 1999). The uncertain nature of the high-tech industry, as well as competition among high-tech firms for market share, creation of entry barriers and establishment of property rights in new technology force high-tech firms to require heavy investments in intangible assets derived from R&D expenditures (Lev and Sougiannis, 1996). Kwon (2002b) documents that the ratio of R&D expenses to assets for high-tech firms is, on average, seven to ten times greater than that for low-tech firms. He also shows that ratio of sales, general and administrative expenses deflated by revenues for high-tech firms is, on average, three times greater than that for low-tech firms. A substantial part of sales, general and administrative expenses of high-tech firms is, in fact, an investment in increasing the customer-base and developing new businesses (Amir and Lev, 1996).

Beaver and Ryan (2000) document that balance sheet conservatism is more pronounced for firms that depreciate assets more rapidly and spend more on R&D and advertising. Because high-tech firms are more dependent than low-tech firms on innovations that generate new products and services, they are likely to incur higher R&D expenses, selling and administrative expenses, and other related expenses and thus are more likely to be conservative in financial reporting.

Moreover, intangible assets are typically not included in net assets, because their values are not verifiable and in liquidation many intangible assets are likely to have a value of zero (Holthausen and Watts, 2001, p. 36). The considerable investment in intangibles in high-tech firms can depress earnings and book values, thus artificially inflating both price-earnings and market-to-book ratios.

Second, high-tech firms are characterized by substantial uncertainties and they are disproportionately affected by shareholder litigation. We argue that in the technology section the litigation risk helps align managerial and shareholder interests by encouraging conservative financial reporting. Patterns of management response to the litigious environment are documented by Kaznik and Lev (1995) and Skinner (1994, 1997). Beaver (1993) and Watts (1993) assert that litigation under the Securities Acts encourages conservatism because litigation is much more likely when earnings and net assets are overstated, not understated. Francis et al. (1994), Johnson et al. (2001) find that present U.S. conservatism results from shareholder litigation.

About one-third of federal securities law class actions involve tech firms (Grundfest and Perino, 1997). The higher volatility of tech firms' stock prices makes it more likely for their shareholders to experience a large wealth decline at some time, and therefore high-tech firms face economically higher probabilities of shareholder class action lawsuits, especially during a period of alleged mispresentation. As the expected costs of litigation increase, in order to reduce their exposure to political costs that arise when investors sustain losses, managers of high-tech firms have incentives to adopt a more conservative reporting stance. The increasingly litigious environment in high-tech industry has also lead auditors to be more conservative. Krishnan and Krishnan (1997) find that auditors are more likely to resign from jobs that have a high probability of litigation. Consequently, auditors are expected to be more conservative in response to exogenous increases in their legal liability exposure.

Third, because of technological innovations, high-tech firms are more likely to fund operating activities by raising capital from external investors (Trueman, Wong, and Zhang, 2000). High-tech firms that publicly commit to conservative accounting

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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.

Fourth, since 1991 and the rise in the popularity of the World Wide Web, high-tech firms have attracted more attention from financial analysts and the investment community than low-tech firms due to their immense growth opportunities. Kwon (2002a) shows that on average there are more financial analysts who follow high-tech firms than low-tech firms.[4] Managers of high-tech firms, who are under financial analysts' constant scrutiny, are more likely to engage in conservative practices.

Finally, high-tech firms with high growth potential are expected to be more susceptible to economic volatility and therefore, have an incentive to be conservative in 'good times' in order to smooth earnings over time. Given that the period of the 1990s was characterized by the irrational exuberance in U.S. stock markets, the formation of record budget surpluses from governmental tax revenues, and accessibility of large amount of capital in the financial markets, high-tech firms are more likely to take income-decreasing accruals to "bank" earnings for future use.

Based on the above arguments, we construct the following hypothesis in its alternate form:

H1: The level of accounting conservatism is higher in high-tech firms than in low-tech firms.

3. Research design

3.1. Sample

In order to enhance the generality of this study's findings, we combine the technology firms listed on CNNFN.COM (as of July 20, 2000) with high-tech firms as defined by Francis and Schipper (1999) to form a sample of high-tech firms (hereafter, HTC).[5] CNNFN.COM is one of the most widely visited and used Internet sites for business news. As in Francis and Schipper (1999), we define HTC firms as those in the computer, electronics, pharmaceutical, and telecommunications industries and obtain 2,706 firms. Upon adding the additional 22 companies that are listed on CNNFN.COM and also on 1999 COMPUSTAT, the HTC sample increases to 2,728 firms. We obtain 984 low-tech firms (hereafter, LTC) using a similar definition as in Francis and Schipper (1999).

The sample distribution by three-digit SIC codes is shown in Table 1. The three industries that contain most firms in HTC are computer and data processing services

[4] Kwon (2002a) reports that on average twelve analysts follow high-tech firms, compared with nine analysts for low-tech firms.

[5] The detailed site address is http://cnnfn.cnn.com/news/technology/techstocks. The site classifies tech stocks in several categories: tech blue chips (15), cable (7), chips (31), computer/peripherals (16), internet (16), networking (9), satellite (5), software (29), tech retail (3), telecommunications (12), telecommunications (global) (3), and wireless (16). Some companies like Motorola, AT&T, IBM, Hewlett-Packard, etc. are included in more than one category.

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Table 1 High-tech and low-tech samples

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
Panel B: Low-Tech Firms (LTC)		
421	Trucking & Courier Services	67
440	Water Transportation	34
451	Scheduled Air Transportation	52
541	Grocery Stores	63
Total		984

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(907), drugs (453), and computer and office equipment (314). The three most conspicuous industries in LTC are motor vehicles and equipment (120), paper and allied products (260), and miscellaneous plastics products (80).

3.2. Measure of conservatism

We use fourdifferent measures of conservatism as in Givoly and Hayn (2000) and Basu (1997), as well as discretionary accruals as a proxy for conservatism. Multiple measures of conservatism are used because the concept of conservatism is somewhat ambiguous, and there has not been a consensus on the definition of conservatism in accounting literature.[6]

3.2.1. Conservatism as continuous recognition of more bad news than good news

Givoly and Hayn (2000) recognize that conservatism directly affects the magnitude of earnings. Following Stickney and Weil (2000, p. 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 nonoperating accruals. Operating accruals arise from the basic day-to-day business of a firm, including changes in accounts receivable, inventory, prepaid expense, accounts payable, and tax payables. Nonoperating 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 nonoperating accruals are largely subject to management discretion and, thus, a more accurate measure for conservatism.

Consistent with Givoly and Hayn (2000), nonoperating accruals are calculated as follow :

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

[6] For example, FASB Statement of Concepts No. 2 offers an official definition of conservatism as "a prudent reaction to uncertainty to try to ensure that uncertainty and risks inherent in business situations are adequately considered." This definition does not clearly describe what conservative reactions and the effect of the reactions on the financial statements are.

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$$\begin{aligned}\text{Operating accruals} &= \Delta\ \text{Accounts Receivable} + \Delta\ \text{Inventories} + \Delta\ \text{Prepaid Expenses} - \Delta\ \text{Accounts Payable} - \Delta\ \text{Tax Payable}\\ \text{Non-operating accruals} &= \text{Total accruals (before depreciation)} - \text{operating accruals}\end{aligned} \quad (1)$$

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.[7] We thus deflate accruals alternatively by assets and sales.[8] If conservative accounting practices tend to minimize accounting earnings, then conservative firms would be more likely to have higher levels of negative (or lower level of positive) cumulative nonoperating accruals over time than other firms.

3.2.2. Conservatism as earlier recognition of bad news than good news

Holthausand and Watts (2001), Ball et al. (2000), Pope and Walker (1999), Basu (1997), and Wolk et al. (1992) assert that conservatism is essentially an issue of the timing in the recognition of revenues and expenses. Conservatism serves as a mechanism for managers to bond against exploiting their asymmetrically informed position relative to other stakeholders, so that the earnings report via auditing and conservatism often conveys the first tiding of bad news. For example, Wolk et al. (1992, p. 125) indicate: "Conservatism is defined as the attempt to select 'generally accepted' accounting methods that result in any of the following: (1) slower revenue recognition, (2) faster expense recognition. . ." Examples of conservative accounting standards include, but are not limited to, rapid depreciation of fixed assets (e.g., the use of accelerated depreciation methods), required expensing of R&D expenditures (SFAS No. 2), and the lower of cost or market inventory valuation which requires early recognition of unrealized losses, causing earnings to reflect 'bad news' more quickly than 'good news' (Basu, 1997; Zhang, 2000). Three measures are adopted under this definition of conservatism.

3.2.2.1 The earnings-return association. Basu (1997) finds that earnings are more correlated with stock movements in periods characterized by bad news than in periods characterized by good news. This is because bad news is reflected in earnings on a more timely basis. When a firm implements conservative accounting practices, it would immediately report the capitalized value of bad news as losses. In contrast, positive earnings require longer time to report because accountants need more verifiable information before they recognize good news earnings.

Moreover, good news earnings are more persistent than bad news earnings. The capitalized value of good news is only partially reflected in current earnings, and is

[7] For the sample period, the average total assets and sales of LTC are approximately four times greater than those for HTC. 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.

[8] Givoly and Hayn (2000) also use assets and sales to control for inflation. In this study, since we compare accumulated nonoperating accruals between high-tech and low-tech firms year-by-year, the difference cannot be attributed to inflation.

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also reflected in subsequent earnings. On the other hand, bad news earnings are fully recognized as expenses when bad news occurs. As a result, the association of stock price movements and earnings in periods of bad news would be stronger than those associations in periods of good news for conservative firms. Therefore, if high-tech firms use more conservative accounting methods than low-tech firms, the association of stock price movements and earnings in periods of bad news compared with their association in periods of good news would be stronger for HTC than for LTC.

We use the following regression equation as in Basu (1997) and Givoly and Hayn (2000) to measure the degree of conservatism: [9]

$$\mathrm{EPS}_{it}/P_{it-1} = \alpha_0 + \alpha_1 \mathrm{DR}_{it} + \beta_0 R_{it} + \beta_1 R_{it} * \mathrm{DR}_{it} + \varepsilon_{it} \quad (2)$$

Where for firm i in year t:

EPS_{it} = earnings per share;
P_{it-1} = price per share at the beginning of the year;
R_{it} = raw return;
DR_{it} = 1 if $\mathrm{R}_{it} < 0$ and 0 otherwise; and
ε_{it} = error term

The indicator variable DR takes a value of one if return is negative and 0 if return is positive. The coefficient on the interaction term R*DR, β_1, captures the incremental response to negative news relative to positive news. If a firm adopts conservative accounting practices, β_1 is expected to be positive. H1 predicts that high-tech firms are more conservative in accounting reporting than low-tech firms, so the magnitude of β_1 is expected to be higher for high-tech firms than for low-tech firms.

The $(\beta_0 + \beta_1)/\beta_0$ ratio measures the sensitivity of earnings to bad news relative to their sensitivity to good news. If a firm practices conservative accounting, $(\beta_0 + \beta_1)/\beta_0$ is expected to be greater than one. Furthermore, if high-tech firms are more conservative and tend to recognize bad news in a more timely manner than low-tech firms, $(\beta_0 + \beta_1)/\beta_0$ is expected to be higher for high-tech firms than for low-tech firms.

R^2_{bad} is the explanatory power of the regression estimated during negative return (bad news) period. R^2_{good} is the explanatory power of the regression estimated during positive return (good news) period. If a firm is conservative in financial reporting, the ratio of the R^2 in bad news periods to the R^2 in good news periods ($R^2_{\mathrm{bad}}/R^2_{\mathrm{good}}$) is expected to be greater than one. H1 predicts that high-tech firms has higher level of conservatism in financial reporting than low-tech firms, and the $R^2_{\mathrm{bad}}/R^2_{\mathrm{good}}$ ratio is expected to be greater for high-tech firms than for low-tech firms.

3.2.2.2 Skewness and variability of earnings. Another set of measures for the level of conservatism is skewness and variability of earnings. Givoly and Hayn (2000, p. 310) indicate that the distribution of earnings would be negatively skewed if financial statements reflect the early and full recognition of unfavorable events and the delayed

[9] As in Beaver et al. (1980), Basu (1997), and Givoly and Hayn (2000), we use the reverse regression technique to better specify OLS standard errors and test statistics. The leading variable, returns, is independent and the lagging variable, earnings, is dependent.

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and gradual recognition of favorable events.[10] Similar to Givoly and Hayn (2000), we examine the skewness and variability of earnings and earnings components—return on asset (ROA), cash flow from operations deflated by total assets (CFOA), total accruals deflated by total assets (TACCR), and nonoperating accruals deflated by total assets (NOA) in high-tech and low-tech firms. We define skewness as $E[(x - \mu_x)/\sigma_x]^3$, where μx and σx are the mean and standard deviation of the distribution of variable x.

If conservatism leads to an immediate recognition of negative earnings and gradual recognition of positive earnings, the variability of earnings should be greater under the more conservative accounting practices. H1 predicts that high-tech firms are more conservative than low-tech firms, and therefore the distribution of earnings is expected to be more negatively skewed and more dispersed for HTC than for LTC.

3.2.3. Discretionary accruals

Managers seeking conservative income reporting could induce it via discretionary accounting choices (Watts and Zimmerman, 1978).[11] Discretionary accruals have been used widely as a proxy for earnings management (e.g., Jones, 1991; Dechow et al., 1995; Francis et al., 1999; among others). Earnings can be decomposed into three components—cash flows from operations, nondiscretionary accruals, and discretionary accruals. Unlike other components of earnings, discretionary accruals are more subjective and reflect a higher degree of managerial judgment and therefore we focus on discretionary accruals to compare discretionary accounting choices between high-tech and low-tech firms. If a firm practices conservative (aggressive) accounting, we predict that discretionary accruals will be more likely to have a negative (positive) value. Therefore, if high-tech firms are more conservative (aggressive) in earnings management than low-tech firms, we expect discretionary accruals in high-tech firms to be smaller (greater) than in low-tech firms.

We calculate discretionary accruals using the cross-sectional modified Jones model (Dechow et al., 1995). The cross-sectional approach has the advantage of controlling for the effect of changing industry-wide economic circumstances on total accruals and allowing the coefficients to change across years due to possible structural changes.[12] For every year t from 1992 to 1998, the following model is estimated by two-digit SICs so that the industry effect is controlled for:

$$\text{TACCR}_{it}/A_{it-1} = a_t(1/A_{it-1}) + b_{1t}(\Delta\text{REV}_{it}/A_{it-1}) + b_{2t}(\text{PPE}_{it}/A_{it-1}) + \varepsilon_{it} \quad (3)$$

[10] Our tests of skewness focus on earnings or earnings components. In contrast, McNichols (1988) examines the skewness of stock returns during earnings announcement periods and during non-announcement periods.

[11] Prior studies find that discretionary accruals are different between high-tech firms and low-tech firms because of market pressure (Barth et al., 1999; Skinner and Sloan, 2002) and executive compensation (Kwon and Yin, 2006).

[12] Guay et al. (1996) investigate the relative merit of various discretionary accrual models and conclude that the cross-sectional Jones and cross-sectional modified Jones models are the most effective in identifying discretionary accruals. DeFond and Jiambalvo (1994), Subramanyam (1996), Bartov et al. (2000); and Gul et al. (2000) further support the adoption of cross-sectional modified Jones model.

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where, for firm i in year t,

TACCR_{it} = total accruals, see footnote;[13]
A_{it-1} = lagged total assets (item #6);
ΔREV_{it} = change in sales (item #12);
ΔREC_{it} = change in accounts receivable (item #2);
PPE_{it} = gross property, plant and equipment (item #7); and
ε_{it} = 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 Eq. (3) for the years 1992–98:

$$\text{DA}_{it} = \text{TACCR}_{it}/A_{it-1} - [a_t(1/A_{it-1}) + b_{1t}(\Delta\text{REV}_{it} - \Delta\text{REC}_{it})/A_{it-1} + b_{2t}(\text{PPE}_{it}/A_{it-1})] \quad (4)$$

where $\text{DA}_{it}$is discretionary accruals and ΔREC_{it} is change in accounts receivable (item #2).

4. Empirical results [14]

4.1. Price-earnings ratio and market-to-book ratio

Figure 1 presents price-earnings ratios and market-to-book ratios of HTC and LTC for each year in the sample period. Figure 1 shows that price-earnings ratios and market-to-book ratios are consistently higher in HTC than in LTC across all years in the sample period (1990–1998). The two-tailed Wilcoxon Z tests (not reported) show that the differences in these two ratios between HTC and LTC are statistically significant at the .01 level.

The fact that high-tech firms have higher price-earnings ratios and market-to-book ratios has been generally regarded by investors as evidence that high-tech stocks are more overpriced than low-tech stocks. Interestingly, however, the same two ratios are interpreted in different ways in prior studies. For example, Givoly and Hayn (2000) interpret high ratios as a sign of conservatism. They argue that the market-to-book ratio as well as the price-earnings ratio should be higher when accounting measurement is more conservative, to the extent that equity valuation by the investors is based on the present value of future cash flows. On the other hand, Francis and Schipper (1999) indicate that market-to-book ratios have been used in prior research for other purposes, such as a proxy for unrecognized intangible assets. As such, the difference

[13] $\text{TACCR}_{it} = \Delta\text{CA}_{it} - \Delta\text{CL}_{it} - \Delta\text{Cash}_{it} + \Delta\text{STD}_{it} - \text{Dep}_{it}$, where, for firm i at time t, ΔCA_{it}= change in current assets (item #4); ΔCL_{it}= change in current liabilities (item #5); ΔCash_{it}= change in cash and cash equivalents (item #1); ΔSTD_{it}= change in debt included in current liabilities (item #34); and Dep_{it}= depreciation and amortization expense (item #14).

[14] Several alternative methods of truncation are used in all analyses: a deletion of observations outside mean ± 3 std, mean ± 4 std, mean ± 5 std; a deletion of extreme 1% of sample observations; and a deletion of an extreme 2% of sample observations. The results are robust to such alternative treatments.

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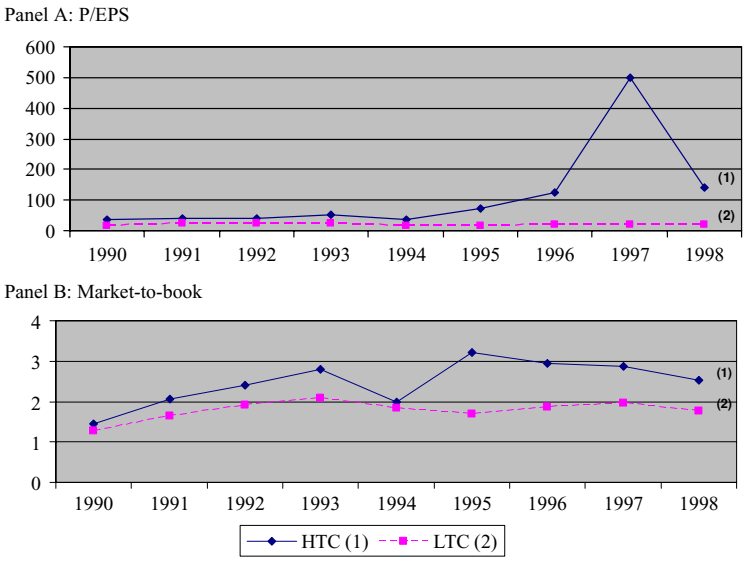

[a] The definitions of variables are given below with annual COMPUSTAT items in parentheses: P/EPS = share price at fiscal year-end (199) divided by primary earnings per share before extraordinary items (58), and Market-to-Book = share price at fiscal year-end (199) divided by book value of equity per share (60/25).

Fig. 1 Price-earnings ratio and market-to-book ratio[a]

in the market-to-book ratios between HTC and LTC would reflect the difference in real economic development, rather than the difference in prudent accounting practices or overreaction of the market.

The confusion in the interpretation of price-earnings ratios and market-to-book ratios is due to the fact that these two ratios are determined by a combination of accounting earnings and the market reaction.Since these two factors are intermingled in these two ratios, we cannot be sure whether it is the market reaction and/or accounting earnings that make the ratios higher for high-tech firms. The five measures of conservatism used in this study could control these alternative explanations. At least four of them, (1) nonoperating accruals, (2) skewness of earnings, (3) variability of earnings, and (4) discretionary accruals, use accounting figures only.

4.2. Nonoperating accruals

4.2.1. Cumulative nonoperating accruals

Figure 2 shows that both cumulative total accruals and cumulative nonoperating accruals are negative for HTC across all years, regardless whether they are deflated by assets or sales. Moreover, Fig. 2 reveals that cumulative total accruals and cumulative nonoperating accruals are more negative for HTC than for LTC. These results strongly suggest that high-tech firms are more conservative in financial reporting, supporting H1.

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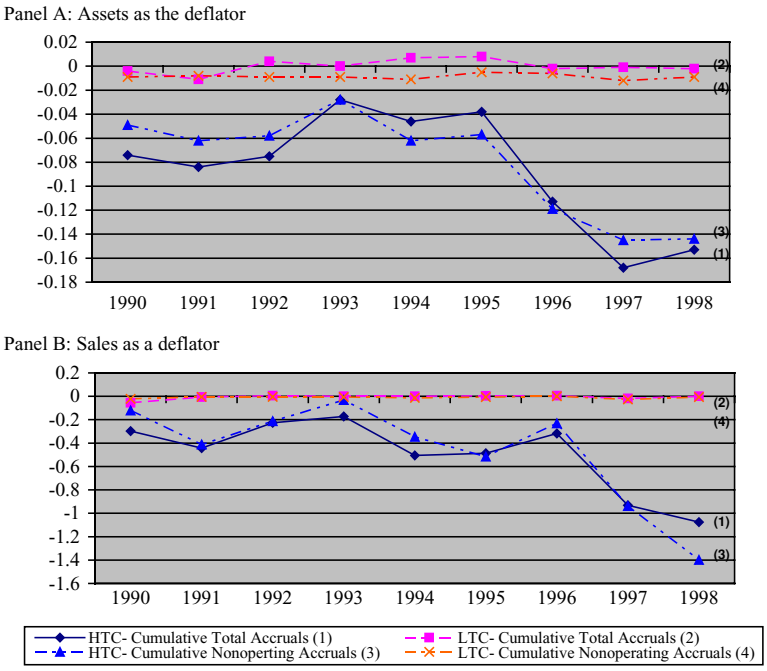

[a] Total accruals (before depreciation) = (Net Income + Depreciation) – Cash Flows from Operating Activities; Nonoperating Accruals = Total Accruals (before depreciation) – Operating Accruals; and Operating Accruals = ΔAccounts Receivable + ΔInventories + ΔPrepaid Expenses - ΔAccounts Payable - ΔTaxes Payable.
[b] The number of observations is 3,423 for HTC firms and 2,736 for LTC firms.

Fig. 2 Cumulative total accruals and cumulative nonoperating accruals (1990–1998)[a,b]

Table 2 compares means and medians of cumulative total accruals and cumulative nonoperating accruals between the two groups. The mean (median) of nonoperating accruals deflated by assets is –0.088 (−0.014) for HTC, compared to –0.009 (−0.006) for LTC. Similarly, the mean (median) of nonoperating accruals deflated by sales is –0.524 (−0.015) for HTC, and –0.010 (−0.004) for LTC. Results show that both cumulative nonoperating accruals and cumulative total accruals are lower for HTC than LTC, and t-tests and Wilcoxon tests indicate that the differences are significant at the 1% level regardless of the deflators used.

The results of Fig. 2 and Table 2 strongly suggest that high-tech firms not only practice conservative accounting, but are more conservative in financial reporting than low-tech firms, supporting H1.

4.2.2. Alternative explanations for negative nonoperating accruals

Givoly and Hayn (2000) offer alternative explanations for the increased level of cumulative negative nonoperating accruals. They entail (1) restructuring activities, (2) mergers and acquisitions, and (3) increased cost of pension and post-retirement benefits. These alternative explanations are discussed below.

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Table 2 Cumulative total accruals and cumulative nonopertaing accruals (1990–1998)[a,b]

	Cumulative total accruals (before depreciation)		Cumulative nonoperating accruals	
Deflator	Mean (*t*-value)	Median (Wilcoxon Z)	Mean (*t*-value)	Median (Wilcoxon Z)
Assets				
HTC	−0.094	−0.008	−0.088	−0.014
LTC	0.000	0.001	−0.009	−0.006
	(−7.18)**[c]	(−7.43)**	(−7.08)**	(−11.97)**
Sales				
HTC	−0.539	−0.010	−0.524	−0.015
LTC	−0.007	0.000	−0.010	−0.004
	(−4.25)**	(−7.49)**	(−3.80)**	(−13.58)**

[a]Total accruals (before depreciation) = Net Income before Depreciation − Cash Flows from Operations; Nonoperating Accruals = Total Accruals (before depreciation) − Operating Accruals; and Operating Accruals = ΔAccounts Receivable + ΔInventories + ΔPrepaid Expenses − ΔAccounts Payable − ΔTaxes Payable.
[b]The number of observations used in this analysis is 3,423 for HTC firms and 2,736 for LTC firms.
[c]**Indicates a statistical significance level of 1%, in one-tailed tests (HTC < LTC).

4.2.2.1. Restructuring. Given that high-tech firms produce items with a higher degree of obsolescence, they are more vulnerable to inventory write-downs. Also, high-tech firms are more aggressive in acquiring technology start-up companies (e.g., IPOs) to stay ahead in the same industry. As a result, high-tech firms face a greater necessity to restructure and reengineer. It is possible that the charges related to restructuring or reengineering activities result in a decline in net income and an accumulation of negative nonoperating accruals without implying a greater degree of accounting conservatism for high-tech firms.

In order to examine this alternative explanation, we recompute nonoperating accruals, excluding special items (COMPUSTAT #17) and discontinued operations (#66) that serve as proxies for restructuring or reengineering activities. We find similar results, as presented in the first two columns of Table 3: (1) The signs of nonoperating accruals of HTC are all negative; (2) nonoperating accruals are more negative for HTC than for LTC; and (3) the differences in nonoperating accruals between HTC and LTC are significant at the 1% level, regardless of the deflators used.

4.2.2.2. Mergers and acquisitions. Prior studies show that high-tech firms generally differ from low-tech firms in the frequency and amount of goodwill amortization that arises from mergers and acquisitions (Amir and Lev, 1996; Shevlin, 1996). It is possible that charges related to goodwill amortization from the use of the purchase method in mergers and acquisitions generate an accumulation of negative nonoperating accruals for high-tech firms without implying a greater degree of accounting conservatism. To investigate this possibility, we recompute nonoperating accruals, excluding depreciation & amortization (#14) and interest expenses (#15). As shown in the third and fourth columns of Table 3, HTC shows a greater accumulation of negative nonoperat-

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Table 3 Nonoperating accruals—alternative explanations[a, b]

	Restructuring (special and discontinued items excluded)		Mergers and acquisitions (depreciation and interest exp. excluded)		Pension costs (pension and post-retirement exp. excluded)		All excluded	
Deflator	Mean (*t*-value)	Median (Wilcoxon Z)	Mean (*t*-value)	Median (Wilcoxon Z)	Mean (*t*-value)	Median (Wilcoxon Z)	Mean (*t*-value)	Median (Wilcoxon Z)
Assets								
HTC	−0.036	−0.005	−0.054	−0.001	−0.078	−0.012	−0.005	0.011
LTC	−0.002	−0.003	0.014	0.014	−0.001	0.000	0.029	0.026
	(−4.35)**[c]	(−4.63)**	(−7.40)**	(−17.35)**	(−7.05)**	(−15.42)**	(−14.05)**	(−5.88)**
Sales								
HTC	−0.388	−0.005	−0.388	−0.002	−0.547	−0.012	−0.213	0.011
LTC	−0.003	−0.002	0.014	0.011	−0.004	0.000	0.028	0.019
	(−2.96)**	(−5.53)**	(−2.70)**	(−15.21)**	(−3.56)**	(−15.20)**	(−9.61)**	(−1.88)*

[a]Nonoperating Accruals = Total Accruals (before depreciation) − Operating Accruals; Total Accruals (before depreciation) = (Net Income + Depreciation) − Cash Flows from Operations; Operating Accruals = ΔAccounts Receivable + ΔInventories + ΔPrepaid Expenses − ΔAccounts Payable − ΔTaxes Payable.

[b]The number of observations 3,015 for HTC and 2,567 for LTC. To avoid a drastic reduction of usuable observations, the missing values of pension and post-retirement expenses are set to zero.

[c]*and **indicate statistical significance levels of 5% and 1%, respectively, in one-tailed tests (HTC < LTC).

ing accruals than LTC in all cases, and the differences are significant at the 1% level regardless of deflators used.

4.2.2.3. Cost of pension and post-retirement benefits. It is also possible that charges related to pension and post-retirement benefits result in a buildup of negative nonoperating accruals without implying a greater level of accounting conservatism for high-tech firms. However, we do not expect that controlling for costs of pension and post-retirement benefit will eliminate or reduce the difference in the cumulative nonoperating accruals between HTC and LTC. This is because in high-tech firms compensation largely consists of long-term incentive-based compensation, e.g., stock options, whereas low-tech firms are more likely to rely on the traditional defined-benefit pension plans. Thus, we expect that the difference in cumulative nonoperating accruals between high-tech and low-tech firms would become even larger when net periodic pension (#43) and post-retirement (#292) expenses are excluded from net income. [15] The fifth and sixth columns of Table 3 compare the levels cumulative nonoperating accruals excluding pension and post-retirement expenses between the two groups. Results consistently show that cumulative nonoperating accruals for low-tech firms are less negative than those reported in Table 2, and high-tech firms have significantly higher negative nonoperating accruals than low-tech firms, supporting H1.

4.2.2.4. All excluded. The last two columns of Table 3 show the comparison of nonoperating accruals excluding charges related to restructuring, mergers and acquisitions, and pension costs between high-tech and low-tech firms. Results indicate that the levels of nonoperating accruals are lower for HTC than LTC, and the results are significant, as shown by the t-test and Wilcoxon test statistics.

In summary, the previous reported results are robust to these competing explanations and consistent with H1's prediction that high-tech firms are more conservative in financial reporting than low-tech firms.

4.3. Earnings-return association

The theory of conservatism predicts that earnings are more correlated with stock movements in periods characterized by bad news than in periods characterized by good news. As predicted by H1, if high-tech firms are more conservative in financial reporting than low-tech firms, the association between stock price movements and earnings in periods of bad news, compared with that in periods of good news, would be stronger for high-tech firms than for low-tech firms.

Table 4 shows the earnings-return association based on pooled cross-sectional results. In the full model, the coefficient on $R*$DR, β_1, which measures the incremental response to bad news relative to good news, is positive and significant for HTC (3.692, $t = 7.62$). β_1 is not significant for LTC (0.072, $t = 0.35$). This indicates that in high-tech firms the association between earnings and return in the periods of bad news is

[15] Business Week article (August 13, 2001) entitled "Why Are Earnings Too Rosy?" reports that companies having defined-benefit plans tend to be in older industries, such as autos, metals, aerospace, forest products, and old Baby Bell telephone systems. These firms are classified as low-tech in this paper.

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Table 4 Earnings-return association (1990–1998)
$EPS_{it}/P_{it-1} = \alpha_0 + \alpha_1 DR_{it} + \beta_0 R_{it} + \beta_1 R_{it} * DR_{it} + \varepsilon_{it}^{a}$

	α_0[c]	α_1	β_0	β_1	Adj. R^2	$(\beta_0+\beta_1)/\beta_0$[d]		R^2_{bad}/R^2_{good}[d]	
						Median	Wilcoxon Z	Median	Wilcoxon Z
HTC									
Simple	0.012		0.468		0.030				
Model	(1.52)		$(4.92^{w})^{**b}$						
Full	−0.112	0.011	0.077	3.692	0.090	11.73	2.47**	10.57	2.92**
Model	$(-7.74)^{**}$	(1.01^{w})	(1.17^{w})	$(7.62^{w})^{**}$					
LTC									
Simple	0.045		0.079		0.000				
Model	$(4.21)^{**}$		(0.97)						
Full	0.044	−0.007	0.026	0.072	0.000	0.36		0.13	
Model	$(3.48)^{**}$	(−0.57)	(0.24)	(0.35)					

[a]For firm i in year t, EPS_{it} = earnings per share; P_{it-1} = price per share at the beginning of the year; R_{it} = raw return; $DR_{it} = 1$ if $R_{it} < 0$ and 0 otherwise; and ε_{it}= error term.
[b]* and ** indicate statistical significance levels of 5% and 1%, respectively, in two-tailed tests. Whenever a violation occurs with respect to the assumptions of homoskedastic errors, independence between the errors and regressors, or the linear specification of the model, White's (1980) heteroscedasticity-consistent t-statistics are reported and indicated as the superscript of w. The top and bottom 1% of EPS and R are deleted. The number of observations is 2,386 for HTC and 2,714 for LTC.
[c]Results are based on pooled cross-sectional time-series data.
[d]Results are based on year-by-year estimation.

stronger than that for low-tech firms, consistent with H1 that high-tech firms are more conservative.

When we compare the adjusted R^2s between the simple model that contains only the returns variable and the full model that adds DR and $R*$DR to distinguish bad news from good news, results show that for HTC, the adjusted R^2 increases from 0.030 for the simple model to 0.090 for the full model. In contrast, there is no change in the adjusted R^2 for LTC when the indicator variable and the interaction term are added. This confirms that high-tech firms are more conservative, as evidenced by the stronger reaction to bad news.

$(\beta_0+ \beta_1)/\beta_0$ and $R^2_{\text{bad}}/R^2_{\text{good}}$ also measure the sensitivity of earnings to bad news relative to their sensitivity to good news. A value greater than one in either case indicates conservative reporting. As reported in Table 4, these two ratios are both greater than one for HTC and less than one for LTC. More specifically, the median value of $(\beta_0 + \beta_1)/\beta_0$, estimated year-by-year, is 11.73 for HTC, and only 0.36 for LTC. It implies that for HTC, earnings are about twelve times more sensitive to negative returns than to positive returns. For LTC, earnings are about three times more sensitive to positive returns than to negative returns. The difference of the ratio between the two groups is statistically significant at the 1% level (Wilcoxon $Z = 2.47$). On the other hand, median $R^2_{\text{bad}}/R^2_{\text{good}}$ is 10.57 for high-tech firms and 0.13 for low-tech firms, and the difference is significant (Wilcoxon $Z = 2.92$), confirming H1 that high-tech firms are more conservative.

The results in Table 4 are overall consistent with the prediction that stock returns of high-tech firms reflect unfavorable events in a more timely manner in the financial statements than those of low-tech firms. That is, negative events are registered in earnings more promptly than positive events in the financial reporting of high-tech firms vis-à-vis low-tech firms. Therefore, high-tech firms are more conservative in financial reporting than low-tech firms, supporting H1.

An alternative explanation for the results in Table 4 is that the higher correlation of accounting earnings with stock returns in the periods of bad news reflects not accounting conservatism, but rather aggressive accounting. If high-tech firms are already more conservative in their normal reporting, most of the bad news would have been discounted in the stock prices and therefore negative news should have a less depressing effect on the stock prices. In contrast, if high-tech firms have highly inflated stock prices based on inflated earnings (aggressive accounting), any potential bad news would quickly deflate stock prices which have not yet discounted the potential for bad news. Good news, on the other hand, would already have been anticipated in the stock price, so the release of the news has little or no effect.

In order to examine this possibility, we adjust both earnings and returns by market expectations because eliminating the market effect from our dependent and independent variables controls for market participants' ex-ante predisposition to the level of conservatism. More specifically, we subtract mean analysts' EPS forecast at the end of the fiscal year from EPS, and CRSP equally weighted market return from R. Results for the full model (not tabulated for brevity) show that for high-tech firms, the coefficient on $R_{it}*\text{DR}_{it}$ is 0.055 and statistically significant at the 1% level. For low-tech firms, the coefficient on $R_{it}*\text{DR}_{it}$ is 0.054 and insignificant. The ratio of $R^2_{\text{bad}}/R^2_{\text{good}}$ is 2.12, and significant at 1%. The results based on the adjusted measures are consis-

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tent with the evidence presented in Table 4, indicating that high-tech firms are more conservative in financial reporting than their counterparts.

4.4. Skewness and variability of earnings

Table 5 shows the results of two additional measures of conservatism: skewness and variability of the earnings distribution. If a conservative financial reporting system is characterized by the early and full recognition of bad news and the delayed and gradual recognition of good news in financial statements, the distribution of earnings is expected to be negatively skewed and with higher variability.

Panel A of Table 5 reports the skewness of four variables: ROA, CFOA, TACCR, and NOA. A larger negative number indicates the distribution is more negatively skewed. In the first column, the mean (median) skewness ROA is −3.169 (−3.211) for HTC, and –1.095 (−0.938) for LTC. The skewness of ROA is significantly more negative for HTC than for LTC (Wilcoxon $Z = -3.53$), indicating high-tech firms are more likely to recognize losses. We further examine the skewness of the distribution for the two earnings components: cash flows from operations (CFOA) and total accruals (TACCR). The second column shows the skewness of cash flows from operations deflated by total assets and the third column total accruals deflated by total assets. It reveals that the mean and median skewness of CFOA and TACCR are both more negative for HTC, supporting results in the first column. Column 4 shows the distribution of nonoperating accruals (NOA). On average, the skewness of NOA is more negative for HTC, supporting H1 that HTC is more conservative.

Penal B of Table 5 shows the standard deviations of the four variables. In all four columns, the mean and median standard deviations for HTC are consistently higher than those for LTC and the differences are significant at the 1% level.

Based on the results reported in Table 5, we can conclude that (1) earnings of high-tech firms are more negatively dispersed than those of low-tech firms, and (2) there is greater variability in earnings distribution for high-tech firms. The higher propensities of negative skewness and variability of earnings distribution in high-tech firms support H1 that predicts higher level of conservatism in high-tech firms.

4.5. Discretionary accruals

Table 6 compares the levels of discretionary accruals deflated by lagged assets between HTC and LTC for each year in the sample period. First, Table 6 shows that in seven out of nine years, the level of discretionary accruals is lower for HTC than LTC, and in six years the difference is significantly negative as shown by the Wilcoxon Z statistics. Second, Table 2 reveals that the average discretionary accruals is negative (−0.005) for HTC, but positive (0.036) for LTC and the difference is statistically significant at the 1% level in both the parametric t-test ($t = -2.57$) and the nonparametric Wilcoxon Z test ($z = -11.92$).

The graphical comparison of the level of discretionary accruals between the two groups is presented in Fig. 3. A visual examination of Fig. 3 indicates that discretionary accruals of HTC and LTC are indistinguishable from 1992 to 1994, but they are lower in HTC than in LTC in all other years except 1996. One peculiar finding in Fig. 3 is that discretionary accruals of LTC fluctuate widely across the period whereas those of

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Table 5 Skewness and standard deviation of earnings, cash flow from operations, total accruals, and nonoperating accruals (1990–1998)[a]

	(1) ROA		(2) CFOA		(3) TACCR		(4) NOA	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Skewness[b,c]								
HTC	−3.169	−3.211	−2.640	−2.638	−3.271	−2.876	−3.221	−3.307
LTC	−1.095	−0.938	−0.213	−0.162	−0.020	−0.102	−0.531	−0.638
Wilcoxon Z		(−3.53)**[d]		(−3.53)**		(−3.52)**		(−3.44)**
Panel B: Standard Deviation								
HTC	0.495	0.393	0.336	0.298	0.248	0.220	0.193	0.163
LTC	0.085	0.069	0.072	0.071	0.057	0.056	0.037	0.039
Wilcoxon Z		(3.55)**		(3.54)**		(3.52)**		(3.56)**

[a]The top and bottom 1% of each variable are deleted in each year. The average value of the standard deviation measure is computed across firms each year from 1990 to 1998. The mean and median of the nine annual average values are reported. The number of observations used is 3,388 for HTC and 2,708 for LTC.

[b]Skewness is defined as $E[(x - \mu_x)/\sigma_x]^3$ where μ_x and σ_x are the mean and standard deviation of the x distribution. All variables are deflated by total assets. The mean skewness is computed across firms in each year from 1990 to 1998. The mean and median of the nine annual average values are reported.

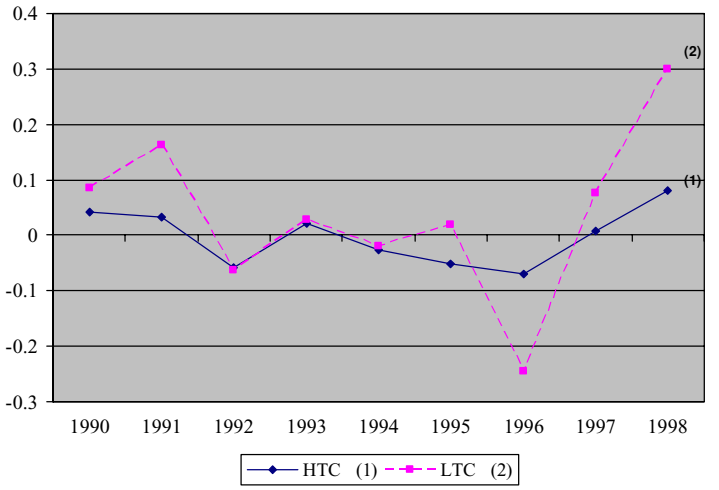
[c]ROA=return on assets; CFO=cash flow from operations deflated by total assets; TACCR=total accruals deflated by total assets; NOA=nonoperating accruals deflated by total assets.

[d]** Indicates a statistical significance level of 1%, in one-tailed tests (HTC > LTC).

Table 6 Discretionary accruals (1990–1998)[a,b]

	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
HTC	0.043	0.032	−0.059	0.022	−0.026	−0.052	−0.070	0.008	0.080	−0.005
LTC	0.086	0.164	−0.064	0.029	−0.019	0.019	−0.246	0.076	0.299	0.036
Student's *t*	−4.75**[c]	−2.19*	0.22	−0.42	−0.48	−0.91	3.13**	−5.59**	−3.79**	−2.57**
Wilcoxon Z	−9.07**	−9.34**	2.97**	−8.18**	3.38**	−3.72**	11.78**	−12.42**	−14.28**	−11.92**

[a]Discretionary accruals are estimated using the cross-sectional modified Jones model by industry and year.
[b]The number of observations used in this analysis is 3,423 for HTC firms and 2,736 for LTC firms.
[c] * and ** indicate statistical significance levels of 5% and 1%, respectively, in two-tailed tests.



[a] The number of observations used in this analysis is 3,423 for HTC firms and 2,736 for LTC firms.
[b] Discretionary accruals are estimated using the cross-sectional modified Jones model by industry and year.

Fig. 3 Discretionary accruals (1990–1998)[a,b]

HTC are relatively stable. The results provide some indications that high-tech firms are more likely to use income-decreasing, or less likely to use income-increasing accounting methods than low-tech firms.

The results in Table 6 and Fig. 3 show that high-tech firms are more likely to take income-decreasing earnings management methods, in comparison to low-tech firms, supporting H1 that high-tech firms are more conservative.

4.6. Additional analyses

4.6.1. Mandated conservatism versus voluntary conservatism

The prior analyses do not distinguish whether the higher level of conservatism in high-tech firms is the result of a conscious decision by the management or the result of mandated accounting rules. For example, the discretionary accrual model does not effectively differentiate between mandated versus voluntary decisions, i.e., discretionary accruals are a holistic concept of total amounts of accruals that can be managed rather than a concept of a specific choice made from among alternative GAAP-based options. We collect additional evidence on two specific areas: inventory valuation methods and depreciation methods, where managerial discretions are possible.

Panel A of Table 7 reports descriptive statistics on percent frequencies in the choice of inventory methods by high-tech and low-tech firms in the sample period. Results show that 25 percent of low-tech firms adopt the more conservative method of LIFO, compared with three percent of high-tech firms. It indicates that low-tech firms are more likely to choose conservative inven-

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Table 7 Inventory valuation methods and depreciation methods (1990–1998)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Panel A: Inventory valuation methods (% of total firms)[a]										
No Inventory										
HTC	17	18	20	21	22	30	32	31	31	26
LTC	9	7	7	5	6	6	6	6	7	6
FIFO										
HTC	59	59	58	58	57	52	51	51	51	54
LTC	43	44	45	48	48	50	49	50	51	48
LIFO										
HTC	4	4	4	3	3	3	2	2	2	3
LTC	28	28	27	25	25	24	24	23	21	25
Specific Identification										
HTC	2	2	2	2	2	2	1	1	1	2
LTC	2	1	1	1	2	1	1	2	1	1
Average Cost										
HTC	12	12	12	12	12	10	10	11	11	11
LTC	16	17	18	18	18	18	18	18	18	18
Retail Inventory										
HTC	0	0	0	0	0	0	0	0	0	0
LTC	1	1	0	1	0	0	0	0	0	0
Standard Cost										
HTC	5	4	4	4	4	3	4	4	4	4
LTC	1	1	1	1	1	1	1	1	1	1
Current Replacement Cost										
HTC	1	1	0	0	0	0	0	0	0	0
LTC	0	1	1	0	0	0	1	0	1	1
Panel B: Depreciation methods (% of total firms)										
TB[b]										
HTC	11	14	12	12	12	11	11	9	9	8
LTC	16	18	18	18	18	16	16	16	16	15
TC										
HTC	3	4	4	4	4	4	3	3	2	2
LTC	3	5	4	3	3	3	2	2	2	2
TS										
HTC	86	81	84	84	84	85	86	88	89	90
LTC	76	72	73	75	75	76	77	78	78	79
TU										
HTC	0	1	0	0	0	0	0	0	0	0
LTC	3	3	3	3	3	3	3	2	2	2
TV										
HTC	0	0	0	0	0	0	0	0	0	0
LTC	0	0	0	0	0	0	0	0	0	0

(*Continued on next page.*)

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Table 7 (*Continued.*)

TX										
HTC	0	0	0	0	0	0	0	0	0	0
LTC	2	2	2	1	1	2	2	2	2	2

[a]Inventory valuation methods are collected from COMPUSTAT (Item #59). In order to avoid presenting more than one inventory valuation method for any affected firm in a year, we use only the method which values the inventory in the highest dollar amount.
[b]Depreciation methods are collected from COMPUSTAT (footnote codes):
TB = Combination of TC and TS;
TC = Computed using either the accelerated method or the units of production method (declining balance, sum-of-the-year's digits, or gross revenue);
TS = Computed using straight-line method;
TU = Combination of ER and TB where ER represents 'does not reflect an exact amount';
TV = Combination of ER and TC where ER represents 'does not reflect an exact amount';
TX = Combination of ER and TS where ER represents 'does not reflect an exact amount'.

tory methods.[16] In the analysis of depreciation methods in Panel B of Table 7, results show imperceptible differences between the two groups in using conservative depreciation methods such as double-declining or sum-of-the-years' digits.

Unless we examine all other specific accounting choices, e.g., asset write-downs, bad-debt estimates, contingent liability accruals, etc., it is difficult to conclude that this paper's empirical regularity is the result of mandated accounting rules rather than the result of deliberate management decisions. In addition, depreciation expenses are treated as non-discretionary accruals in the Modified Jones model to estimate discretionary accruals. The choice of inventory valuation methods is also directly related to a company's operational decisions to save cash (e.g., the adoption of a LIFO method) for debt-related payments rather than for the purpose of conservative reporting.[17]

4.6.2. Market valuation of financial information in high-tech and low-tech firms after controlling for the effect of conservatism

We previously argue that a direct comparison of market valuation metrics between high-tech and low-tech firms would not be meaningful without first adjusting the effect of varying degrees of conservatism between the two groups. In this section, we investigate whether the market valuation metrics still differ between high-tech and low-tech firms, *after* we control the effect of conservatism. We estimate the following

[16] In the periods of falling inventory prices, the use of the FIFO inventory method indicates conservatism. If during the sample period prices of inventories fall, the evidence that 54% of high-tech firms use the FIFO method and only 3% of high-tech firms use the LIFO method is consistent with conservative financial reporting in high-tech firms.

[17] 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; Myers, 1977). Kwon (2002b) documents that the debt-to-asset ratio of high-tech firms is 2 to 4 times lower than that of low-tech firms during the period of the 1990s.

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regression models using the "association" study methodology:

$$\mathrm{CMAR}_{it} = d_0 + d_1\mathrm{INC}_{it} + d_2\Delta\mathrm{INC}_{it} + d_3\mathrm{NOA}_{it} + \Sigma\beta_j\mathrm{IND}_j + \Sigma\beta_k\mathrm{YEAR}_k + \eta_{it} \quad (5)$$

$$\mathrm{CMAR}_{it} = d_0 + d_1\mathrm{INC}_{it} + d_2\Delta\mathrm{INC}_{it} + d_3\mathrm{NOA}_{it} + d_4\mathrm{SALES}_{it} + d_5\Delta\mathrm{SALES}_{it} + \Sigma\beta_j\mathrm{IND}_j + \Sigma\beta_k\mathrm{YEAR}_k + \eta_{it} \quad (6)$$

Where for firm i in year t:

CMAR_{it}	= cumulative market-adjusted return (firm i's return *minus* equally-weighted market return) over a 15-month period ending 3 months following the end of fiscal year t;
INC_{it}	= income before extraordinary items divided by market value of equity at the beginning of the year;
$\Delta\mathrm{INC}_{it}$	= change in income before extraordinary items divided by market value of equity at the beginning of the year;
NOA_{it}	= nonoperating accruals divided by total assets;
SALES_{it}	= net sales divided by total assets;
$\Delta\mathrm{SALES}_{it}$	= change in net sales divided by total assets;
IND_j	=1 if the firm belongs to industry j and 0 otherwise; Industry is defined by two- digit SIC codes;
YEAR_k	= 1 if the firm is in year k and 0 otherwise; and
η_{it}	= error term.

The coefficients d_1 and d_2 in Models (5) and (6) evaluate the value-relevance of accounting earnings. Similarly, d_4 and d_5 in Model (6) measure the value-relevance of sales. We add SALES in Model (6) because sales or changes in sales reflect the growth in customer base and they are likely to be more important for the valuation purposes in high-tech firms vis-à-vis low-tech firms. Nonopearting accruals, NOA, is used as a proxy for the effect of conservatism (Givoly and Hayn, 2000). NOA is expected to be negative because it implies the exercise of caution in the recognition and measurement of income and assets (Givoly and Hayn 2000, p. 291). IND and YEAR are the industry and year dummies included to capture industry-specific and time-specific factors. We run the two models separately on high-tech and low-tech firms.

Panel A of Table 8 shows that in both high-tech and low-tech firms, INC and ΔINC are highly significant and positive; NOA, the conservatism proxy, is negative and significant, consistent with the prediction. The coefficient on ΔINC is much larger and more significant in low-tech firms than in high-tech firms (0.701, $t = 8.38$ for low-tech firms; 0.027, $t = 2.89$ for high-tech firms), indicating that the association between stock returns and change in accounting earnings is higher in low-tech firms. The adjusted R^2 for Model (5) is 0.120 for low-tech firms, 3.4 times higher than that of high-tech firms. Altogether, the results support the view that after we control for the effect of conservatism, earnings are more value-relevant in low-tech firms than

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Table 8 Joint test of value-relevance and conservatism

	Predicted Sign	Sample: HTC Coefficient(t-statistic)	Sample: LTC Coefficient(t-statistic)
Panel A: $CMAR_{it} = d_0 + d_1 INC_{it} + d_2 \Delta INC_{it} + d_3 NOA_{it} + \Sigma \beta_j IND_j + \Sigma \beta_k YEAR_k + \eta_{it}$ [a]			
Intercept		0.045(8.99)**	0.035(10.20)**
INC	+	0.063(4.31)**	0.074(10.02)**
ΔINC	+	0.027(2.89)**	0.071(8.38)**
NOA	−	−0.030(−3.53)**	−0.024(−4.58)**
Adj. R^2		0.036	0.120
F-Value (*p*-value)		4.095(0.00)**	14.072(0.00)**
Chi-Square (*p*-value)		102.703(0.70)	260.931(0.29)
Panel B: $CMAR_{it} = d_0 + d_1 INC_{it} + d_2 \Delta INC_{it} + d_3 NOA_{it} + d_4 SALES_{it} + d_5 \Delta SALES_{it} + \Sigma \beta_j IND_j + \Sigma \beta_k YEAR_k + \eta_{it}$			
Intercept		0.045(8.98)** [b]	0.035(10.32)**
INC	+	0.045(2.93)**	0.058(3.67)**
ΔINC	+	0.029(3.01)**	0.068(3.98)**
NOA	−	−0.029(−3.44)**	−0.021(−3.13)**
SALES	+	−0.016(−2.68)**	0.005(0.82)
ΔSALES	+	0.027(4.03)**	0.037(4.22)**
Adj. R^2		0.048	0.143
F-Value (*p*-value)		4.745(0.00)**	15.890(0.00)**
Chi-Square (*p*-value)		135.194(0.71)	481.319(0.00)**

[a] CMAR = cumulative market-adjusted return over a 15-month period ending 3 months following the end of the fiscal year; INC = income before extraordinary items divided by market value of equity at the beginning of the year; ΔINC = change in income before extraordinary items divided by market value of equity at the beginning of the year; NOA = nonoperating accruals divided by total assets; SALES = net sales divided by total assets; ΔSALES = change in net sales divided by total assets; IND = 1 if the firm belongs to industry *j* and 0 otherwise; industry is defined by two-digit SIC codes; and YEAR = 1 if the observation is in year *k* and 0 otherwise. There are eight (fifteen) industry dummies for HTC (LTC).

[b] Year and industry results are omitted for brevity and regression results are based on White's (1980) test. * and ** indicate statistical significance levels of 5% and 1%, respectively, in two-tailed tests. The top and bottom 1% of each variable are deleted.

in high-tech firms, which is consistent with the claim that high-tech stocks are over-priced.

Panel B of Table 8 reports results of Model (6) where SALES and ΔSALES are added. Results are similar to those in Panel A except that SALES is negative in high-tech firms and not significant in low-tech firms. The coefficient on ΔINC continues to be larger and more significant in low-tech firms. The adjusted $R^2$for Model (6) is 0.143 for low-tech firms, almost three times higher than that of high-tech firms.

The fitness of the valuation model, represented by F-value, is 4.095 (4.745) for HTC and 14.072 (15.890) for LTC firms in Panel A (B). This also supports a stronger relationship between financial information and security returns in low-tech firms than in high-tech firms. In brief, the results of Table 7 provide insight into the differential value relevance of key financial information such as earnings, changes in earnings, sales, and changes in sales between high-tech and low-tech firms, *after* wecontrol for the effect of conservatism. We find that the effect of conservatism cannot close the market valuation gap between high-tech and low-tech firms, suggesting that the effect of conservatism cannot be used as a defense for the over-valuation of high-tech firms.

5. Conclusion

This paper investigates systematic differences in the level of accounting conservatism between high-tech and low-tech firms. We adopt a broader definition of high-tech firms in order to enhance the generality of the findings. We include both high-tech firms listed on CNNFN.COM (practitioners' definition) and high-tech firms as defined in Francis and Schipper (1999) (academicians' definition).

Relying on the recent development in theoretical models and empirical measures of conservatism (e.g., Basu, 1997; Givoly and Hayn, 2000), we compare the level of conservatism between high-tech and low-tech firms. Results based on the five proxies of conservatism show that (1) cumulative nonoperating components are more negative in high-tech firms, indicating a higher level of accounting conservatism; (2) the stock returns of high-tech firms reflect unfavorable events faster than those of low-tech firms. That is, bad news is registered in earnings more promptly than good news in the financial reporting of high-tech firms vis-à-vis low-tech firms; (3) earnings distributions of high-tech firms show higher propensities for negative skewness and variability than those of low-tech firms. The evidence of a more conservative tilt for high-tech firms in financial reporting is robust to the competing explanations suggested in Givoly and Hayn (2000); and (4) the results based on discretionary accruals are consistent with an income-reducing pattern of earnings management for high-tech firms vis-à-vis low-tech firms.[18]

[18] Even though some accounting researchers may view that "high tech" and "conservative" are almost synonyms due to the fact that under U.S. GAAP, R&D expenditures and other investments in intangibles must be expensed rather than capitalized (unconditional or mandatory conservatism), it is still a significant empirical issue whether high-tech firms holistically engage in more conservative financial reporting than low-tech firms, and whether high-tech firms are more aggressive in their discretionary reporting (conditional conservatism).

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Although we find that the effect of conservatism cannot close the market valuation gap between high-tech and low-tech firms, our results suggest that high-tech stocks may not be as overpriced as it has been argued after the level of conservative accounting reporting is considered. Since high-tech firms are more likely to use conservative accounting methods (mandatory or discretionary) than low-tech firms, the traditional measures such as price-earnings ratios or market-to-book ratios cannot effectively measure how much high-tech stocks are overpriced when compared to low-tech stocks. This suggests that a direct comparison between high-tech and low-tech firms would not be proper without first adjusting the effect of varying degrees of conservatism between high-tech and low-tech firms. Therefore, investors, financial analysts, and regulators should consider the different levels of accounting conservatism between high-tech and low-tech firms to more accurately evaluate them.

One limitation of this study is that the sample period does not cover a market crash period. Our sample period includes the 1990s, which are characterized by the irrational exuberance in the U.S. stock market and the formation of record budget surpluses from governmental tax revenues. During this period, high-tech firms with high growth potential are susceptible to economic volatility and therefore have an incentive to be conservative in 'good times' in order to smooth earnings over time. However, in an economic downturn, it is quite possible that the incentive is reversed and thus high-tech firms become aggressive in accounting reporting. Another caveat is that the definition of high- and low-tech companies could change as more firms/industries become technologically advanced. We leave these issues for future research.

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