

How is the High-Tech Bubble Affecting Company Performance?

Cheng-Huei Chiao, Robert Kao, and Michael Russell

Abstract

This study analyzes key financial ratios' variations and helps us understand company financial performance on both high-tech and non-high-tech companies before and after the impact of the high-tech bubble. The composite index of the ranked profitability, assets utilization, liquidity, debt utilization, price to earnings, and market to book value are generated by company level first. The price ratios of high-tech and non-high tech companies are evaluated by a non-linear regression method for the periods before and after the bubble. The outcomes of various ratios are tested by statistical significance for each industry in these time periods. The results show that the high-tech companies have reached a higher efficiency level and the non-high-tech companies have suffered relatively more on profitability level after the high-tech bubble. A significantly lowered return on equity indicates that the high-tech companies have reduced their product unit cost and profit margins. As for the effect of the size of the company, the large high-tech companies have weakened the profit gaining power, but the small high-tech companies have remained profitable after the effect.

I. Introduction

In the 1990s, a record-setting rise in stock valuations of high-tech companies occurred. Many venture capitalists moved in quickly and tried to mitigate the risk by starting as competitors and letting the market decide which stocks would prosper. Besides the low interest rates in 1998–1999 that helped increase the start-up capital amounts on high-tech industries, many aggressive high-tech businesses have relied on joining network effects. These companies were operating at a sustained net loss and tried to build their market shares first. They expected to build enough brand awareness and to turn it into a profitable mode for their services later. Many investors eagerly put more of their new wealth into high-tech companies' securities (Spector, 2000). A bubble in the high-tech sector began to form when speculators noticed the fast rise in its stock value. They anticipated the value would rise even further, rather than because the share was undervalued. Penman (2001) warned that such a bubble could affect consumers from having unreasonable expectations of likely returns and make misguided consumption decisions.

The Federal Reserve Bank (2009) had tried to slow the fast pace booming economy by raising interest rates six times throughout 1999 and early 2000. The overheating market began to show sign of cooling down. The high-tech bubble finally burst on March 10, 2000, when the NASDAQ Composite Index peaked at 5048, which was more than doubled its value from the year before. One possible cause for the collapse of the high-tech companies' stocks was directly involving the massive sell-off of multi-billion dollar orders from their major leading stocks. This huge sell-off resulted in almost four percentage points lower in the NASDAQ opening on Monday, March 13. This triggered a chain reaction of selling off investors' funds and

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institutions' liquidation. Eventually, the NASDAQ lost roughly nine percent of its points and fell to its lowest at 4580 on March 15 (Yahoo! Finance).

The accelerated business spending in preparation for the switchover of Y2K may also contribute to the collapse of the bubble. Businesses' spending on all the equipment they needed for some time had declined quickly when the New Year had passed without any incidents. In addition, the poor results of Internet retailers toward the end of 1999 may have been related to the bursting of the bubble. By 2001, the bubble was deflating even further. A majority of the high-tech companies ceased trading after exhausting their venture capital and without making any net profit. Many high-tech companies were either acquired by other companies or liquidated by creditors (Lowenstein, 2004).

Ever since, the high-tech companies have reshaped the aftermath economy and reflected on their financial positions. In response, many investors have recalibrated their investment strategies. Thereby, we examine key financial ratios with composite ranking indexes before and after the bubble to help us understand the structural changes of all major companies. Furthermore, the high-tech and non-high-tech companies were separated and cross-sectioned for insightful evaluations. The different company sizes are another important factor of the bubble's impact.

The high P/E ratios of the 1990s are now seen as more to do with the quality of prices rather than the quality of earnings after the high-tech bubble (Penman 2002). Glaum and Friedrich (2006) found that today the high-tech companies rely much more on the discounted cash flow analysis method than in the late 1990s, when valuation was largely based on multiples. In line with this, they reported that analysts have changed their focus from revenue-oriented measures towards an assessment of profitability and cash flow generation. Penman and Zhang's research (2004) stated that the P/E ratio has been tracked to analyze sustainability or persistence of earnings. They used the P/E ratio for the amount paid for a dollar of current earnings. This paper specifies and estimates a model that employs financial statement information to indicate the probability of sustainable earnings. Penman and Zhang (2004) indicated that stock returns can be predicted when the market's P/E ratio differs from that indicated by their models. Fama and French (2000) used a simple partial adjustment model with a uniform rate of mean reversion and found that mean reversion is faster when profitability is below its mean and when it is further from its mean in either direction. They concluded that the mean reversion in profitability produced predictable variation in earnings.

Nissim and Penman (2001) also applied a standard profitability analysis in the forecasting payoffs to equities. Their analysis of current financial statements provides historical benchmarks for forecasting, typical values for financial ratios, along with their cross-sectional variation and correlation. In order to view the forecasts, they used the time series behavior of many of the ratios and their typical "long-run, steady-state" levels were documented. Berger and Udell (1998) summarized the empirical findings on collateral and concluded that riskier firms are more likely to pledge collateral. Empirical evidence suggested that there was a negative relationship between a firm's leverage and its intangible assets. The lack of collateral assets held by high-tech firms limited their access to debt financing.

The findings of this study show that the high-tech companies have reduced their proportion of sales to outweigh the reduced product unit cost. In general, the non-high-tech companies have more impact on profitability after the bubble. The high-tech companies have a higher efficiency level than non-high-tech companies after the effect of the crush. The larger high-tech companies have reduced their short-term debt and the small high-tech companies have reduced their inventories after the bubble. The large high-tech companies have reduced the profit gaining power after the bubble, but the small high-tech companies are still maintaining profitability. Also the non-high-tech companies have turned around faster than the high-tech companies after the bubble.

II. Data Structure

Carpenter and Petersen (2002) examined 2,400 publicly traded U. S. high-tech companies over a period from 1981 to 1988 and concluded that most of the small high-tech firms obtained little debt. They also pointed out new equity financing was exceedingly important and permitted a substantial increase in firm size. The data for our study comes from two major sources. It consists of all firms in the intersection of (a) the Center for Research in Security Prices (CRSP) files, and (b) the merged COMPUSTAT annual files of income-statement and balance-sheet data, also maintained by CRSP (Fama and French 1992). We obtained price data from CRSP, and corporate financial ratios data from COMPUSTAT. All 52,895 companies from this database were evaluated.

For the comparative study of financial ratios changes during the high-tech stock market bubble and its aftermath, we separate our data for the period of 1993-2007 into two seven-year segments. The first covers 1993-1999, while the second 2001-2007. In this analysis, we repeat the steps in the main procedure that we have developed for the financial ratios and firms. We compare the results for the two time periods and outline the findings as stated below.

We then identify firms that were in the top 10-percentile of stock price total returns in the period from 1/1/1998 through 3/31/2000. These firms were then tracked by the first three digits of their SIC codes. We then calculate the proportion of the firms in the top 10-percentile group within each three-digit SIC code and identify eleven SIC groups that are within one percentile or less of the concentration of firms as observed in the top 10% group under the binomial probability model. The descriptions of the eleven SIC groups, which we call "high-tech" or "high-growth" sector, are provided in Appendix I.

From the list, we see that a vast majority of the firms are in the industries closely related to Internet, telecommunication, computer, or biomedical products. The proportion of firms in the so-called "high-tech" sector comprises 27% of all firms in our sample for the period 1/1998 – 3/2000. The high-tech companies before and after the high-tech bubble include 9,480 companies or 18.93 percent of the total. The non-high-tech companies before and after the high-tech bubble include 43,415 companies or 82.08 percent of the total. We construct the analysis as described in the following sections for the two seven-year periods and, within each period, for high-tech and non-high-tech firms separately. Hence, we have a total of $2 \times 2 = 4$ sets of results.

III. The Model and the Estimation Procedure

a. Definition of Ratios:

Soliman (2008) used a common form of financial statement analysis, or DuPont analysis, for profit margin and asset turnover ratios to measure accounting information. He indicated that the DuPont components represent an incremental and viable form of information about the operating characteristics of a firm. In this study, we group each set of ratios into two to four individual ratios as components. We then have analyzed and interoperated each set of ratios by our proposed methodologies and models. Listed below are the individual ratios within each set, with their definitions.

- 1) Profitability Ratios:¹
 - Gross Profit Margin Ratio (PM): $\text{Gross Profit} / \text{Sales}$
 - Return on Assets Ratio (ROA): $\text{Net Income} / \text{Assets}$
 - Return on Equity Ratio (ROE): $\text{Net Income} / \text{Stockholder's Equity}$
- 2) Assets Utilization Ratios:
 - Receivables Turnover Ratio (RT): $\text{Sales} / \text{Receivables}$
 - Inventory Turnover Ratio (IT): $\text{Sales} / \text{Inventory}$
 - Fixed Assets Turnover Ratio (FAT): $\text{Sales} / \text{Property, Plant, and Equipment}$
 - Total Assets Turnover Ratio (TATO): $\text{Sales} / \text{Assets}$
- 3) Liquidity Ratios:
 - Current Ratio (CR): $\text{Current Assets} / \text{Current Liabilities}$
 - Quick Ratio (QR): $(\text{Current Assets} - \text{Inventories}) / \text{Current Liabilities}$
 - Net Working Capital to Total Assets Ratio (NWTAR): $(\text{Current Assets} - \text{Current Liabilities}) / \text{Assets}$
- 4) Debt Utilization Ratios:
 - Long-term Debt to Equity Ratio (LTDER): $\text{Long-term Debt} / \text{Stockholder's Equity}$
 - Total Debt to Total Assets Ratio (TDTAR): $(\text{Assets} - \text{Stockholder's Equity}) / \text{Assets}$
- 5) Price Ratios:
 - Price to Earnings Ratio (PE): $\text{Stock Price} / \text{Earning Per Share}$
 - Market to Book Value Ratio (MB): $(\text{Market Price} \times \text{Common Shares Outstanding}) / \text{Stockholder's Equity}$

b. Methodology

The composite index of the ranked profitability, assets utilization, liquidity, and debt utilization ratios has been used for the companies in each industry; each company also has been grouped as a high-tech or non-high-tech company. For comparison purposes between industries, we rank each financial ratio instead of using direct ratio of each company, allowing the different nature and characteristics of each industry to be neutralized and cross-examined in the analysis. First, we create nine equivalent partitions, then group and rank each company in each industry, assigning each company a rank from one through nine. Second, we group those financial ratios into four categories: profitability, assets utilization, liquidity, and debt utilization. The procedure

¹ Cash flow is not included in this study because it is not like financial ratios that have been standardized and is not comparable among different firms. In the profitability ratios, gross profit and net income are close to the cash flow concept. The coefficients of the Profitability Ratios in the regression model showed the largest coefficients comparing to others ratios. In the standard finance theory, it implies that one of the key factors influencing stock prices is the expectation of cash flow.

for ranking composite index for four indices is presented as below.

$$\sum_{i=1}^n [Rank(Ratio_{it})] / n, \quad t = 1, 2, 3... ; \quad (1)$$

where $Rank(Ratio_{it})$ represents the ranking of the financial ratios i at year t .

Third, the nonlinear regression method has been applied in terms of price earning and market to book value ratios for both high-tech and non-high-tech companies. Bates and Watts (1988) provided practical introductions to the nonlinear regression with many examples. Seber and Wild (1989) also developed a more extensive treatment of nonlinear regression methodology. In Soliman's (2007) study, he found that the DuPont analysis was a useful tool of financial statement analysis and applied a linear regression to analyze the DuPont decomposition of a firm's return on net operating assets that had been derived from a theoretical and parsimonious framework of valuation and relates to the operational aspects of the firm. We further adopt the nonlinear regression method for analyzing these grouped financial composite indices in this study. The squared terms represent the accelerated effects of impacts from the composite indices. They are used to test the financial structure change before and after the high-tech bubble occurred in the year 2000. The models are presented below.

$$Y_i = \alpha_i + \sum_{j=1}^4 \beta_j \times Ratiosrank_j + \sum_{j=1}^4 \gamma_j \times (Ratiosrank_j)^2, \quad i = 1 \text{ and } 2; \quad (2)$$

where Y_i represents the market to book value ratios and price to earning ratios for all companies, high-tech, and non-high-tech companies. $Ratiosrank_j$ represents the composite indices of profitability ratios, the composite indices of assets utilization ratios, the composite indices of liquidity ratios, and the composite indices of debt utilization ratios. α_i , β_j , and γ_j represent the coefficients with the corresponding ratios for all companies, high-tech, and non-high-tech companies.

The results of each coefficient in the non-linear regression method would then represent an important effect on the magnitude of each financial ratio in the category. Each coefficient can be used for the comparison between and across the industries. We have examined the variance inflation factor in the regression model for the multi-co linearity problem. The result confirms that the multi-co linearity problem between industry groups is not significant in the model. It is mainly contributed by the composite index ratios used in this study that would prevent the multi-co linearity problem in the estimations. The coefficients of the regression can then generate a meaningful outcome to reflect the ratio variances before and after the bubble.

IV. Empirical Results

a. High-Tech Industries

In Table I Panel A and B, we observe that the significant decline of return on equity from 0.1488 to 0.1395 indicated that the high-tech companies reduced their product unit cost and profits. They have reduced their proportion of sales to outweigh the reduced product unit cost.

Among the mean ratios of assets utilization, RT and IT have increased from 5.5457 to 6.2911 and 14.3448 to 16.2810 after the high-tech bubble, respectively. It again shows the decrease of sales, receivables, and inventory among the high-tech companies after the bubble.

Among the mean ratios of liquidity, we identify that NWTa has declined from 0.4154 to 0.3777 after the effect of the bubble. It shows that the short-term liabilities and current assets have declined; however, the long-term liabilities have increased in the aftermath. When observing debt utilization ratio means, the long-term debts of those high-tech companies have increased some from 0.1641 to 0.1755, but the short-term debts have declined slightly from 0.3585 to 0.3523 after the year 2000.

The price to earnings ratios have increased from 19.5788 to 21.9535 after the bubble and it is shown that the short-term earning per share has declined some. Similarly, the market-to-book value ratios have declined from 3.6101 to 3.3224 after the bubble, and the long-term equity has declined but at an insignificant rate.

Other ratios have shown the larger volatility and higher risk because of their higher standard deviations after the bubble. Also, the ROE, IT, and PE show the wider minimum and maximum values range after the bubble. They are confirmed that the profitability, sales, and short-term earning have become more volatile and higher risk after the bubble.

b. Non-High-Tech industries

In Table I Panel C and D, we observe that after the bubble, the significant higher of ROE mean ratios, comparing 0.1426 with 0.1395, indicate that the non-high-tech companies have less profit than high-tech companies; however, non-high-tech companies have higher liability than high-tech companies, i.e. CR and QR mean ratios are lower in non-high-tech companies. Also, the insignificant sales changes prove that the non-high-tech short-term liability has been declining after the period of the bubble. In general, the non-high-tech companies have more impact on profitability after the bubble.

Among the mean ratios of assets utilization, the significant lower of RT, comparing 5.5107 to 6.2911, has indicated a small increase of receivables after the high-tech bubble. The increase of IT from 13.3245 to 20.8291 mean ratios explains that there is a small increase of sales and receivables. The decline of both FAT and TATO, reducing from 3.6805 to 3.5892 and from 0.8425 to 0.7606 respectively, has indicated a small decline of sales.

As for the liquidity ratios, the decline of CR from 2.3722 to 2.3148 describe that the short-term current liabilities and assets have declined after the bubble. However, the increase of QR from 1.6842 to 1.7227 and decrease of NWTa from 0.1721 to 0.1500 have shown the decrease of inventories.

When we observe debt utilization ratios, the increase of LTDE and TDTAIT from 0.3890 to 0.4186 and from 0.5391 to 0.5408, respectively, shows that the increase of long-term debt and short-term debt have increased modestly after the bubble, respectively.

Both PE and MB ratios have increased from 14.2151 to 16.0375 and 2.3298 to 2.4271,

respectively after the bubble. The significant increase of MB has shown a small increase in price and equity after the bubble. The higher standard deviations of other ratios have shown that the profitability, sales, and long-term equity have higher volatility and risk after the year 2000.

c. Financial Ratios

Table II Panel A and B provides a comparison of means and slopes for all companies before and after the high-tech bubble burst. When we cross examine the high-tech and non-high-tech companies, mean values of profitability ratios have shown similar impacts on PM ratios. However, the high-tech companies have reduced more costs than the non-high-tech companies. In terms of ROA and ROE, the high-tech companies have had more impact after the bubble than the non-high-tech companies.

As for the trends or slopes of the profitability ranks, the high-tech companies' PM ratios did not show much difference after the bubble. However, their ROA and ROE ratios had shown significant difference after the bubble. This phenomenon indicates that the proportion of net income among high-tech companies has grown more than their assets and equities. The trend has shown a strong recovery after the bubble. When we observe the non-high-tech companies, all three ratios - PM, ROA, and ROE - have had stronger recoveries. The slopes of ROA and ROE ratios have especially had stronger outcomes than the high-tech companies.

Mean values of FAT and TATO ratios showed the different management among the high-tech and non-high-tech companies after the bubble. It means that the high-tech companies have a higher efficiency level than non-high-tech companies after the effect of the crash.

From the trends or slopes standpoint, RT ratios show that the high-tech companies' receivables have increased and then remain stable after the bubble. However, the non-high-tech companies remain at about the same level of receivables at the beginning but relieve some later on. The IT ratios showed that the high-tech companies' inventories were high before the bubble. The inventories had improved some in the first two years, but they were built up again after that. As for the non-high-tech companies, the level of inventories was lower than the high-tech companies had at the beginning and reduced afterward.

After the bubble, the trend of FAT ratios dropped to the bottom and rose up again thereafter. The high-tech companies had higher TATO ratios than the non-high-tech companies, but they declined after the bubble. In general, the non-high-tech companies have a lower declining rate or they are more mature than the high-tech companies.

The mean values of liquidity ratios show that the non-high-tech companies have lowered risk but they have a more difficult time obtaining the capital than the high-tech companies. The high-tech companies' mean ratios have reduced more than non-high-tech companies.

The non-high-tech companies' trends of CR and QR ratios have increased slightly after the bubble. The high-tech companies are more stable but there was not a significant change in their trends. Regarding the trend of NWT, the high-tech companies have reduced slightly and then remain stable after the bubble. Their ratios were quite stable before and after the bubble.

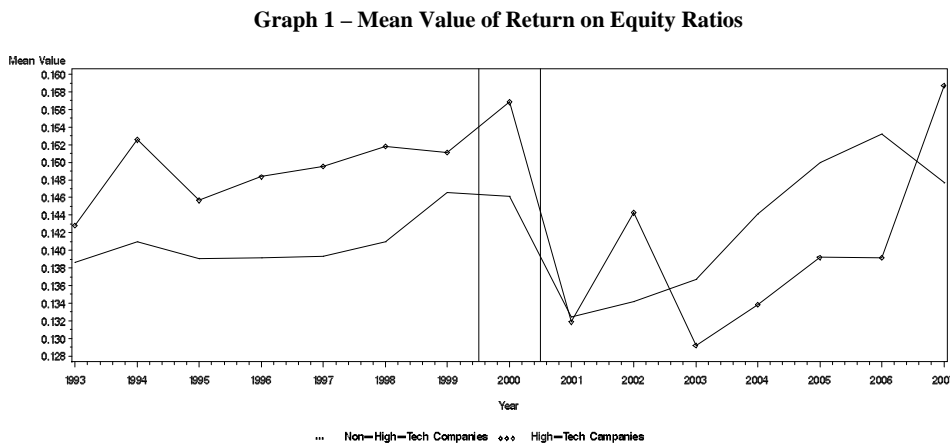
The mean values of LTDE and TDTA ratios for the non-high-tech companies are higher than the high-tech companies both before and after the bubble. The mean values of LTDE indicate that the high-tech companies have increased their debt significantly. Both categories of companies have changed the LTDE after the bubble. From the slopes of debt utilization ratios, we observe that the non-high-tech companies are more cautious in borrowing the capital than the high-tech companies.

High-tech companies' mean values of PE and MB were higher than non-high-tech companies'. Non-high-tech companies had more significant changes after the bubble. The price reduced more than earnings per share in terms of magnitudes after the bubble.

In terms of the slopes of PE and MB ratios, the high-tech companies were higher but not significantly so in terms of statistics tests aftermath. For non-high-tech companies' PE, the slopes of its ratios were not significant. The capital had been transferred from the non-high-tech to the high-tech companies. The higher trend of MB showed that in the long-run people still like to invest the high-tech companies' securities. After the bubble, the gaps of slopes of MB between high-tech and non-high-tech companies have been shrinking. Investors have emphasized more on fundamental analysis after the bubble.

V. Graphic Results

Mean values of return on equity ratios have shown the pattern change after the bubble in Graph 1. The high-tech ratios were higher than the non-high-tech ratios before the bubble, but revealed the mixed results after the year 2000. The ratios became random between two categories.

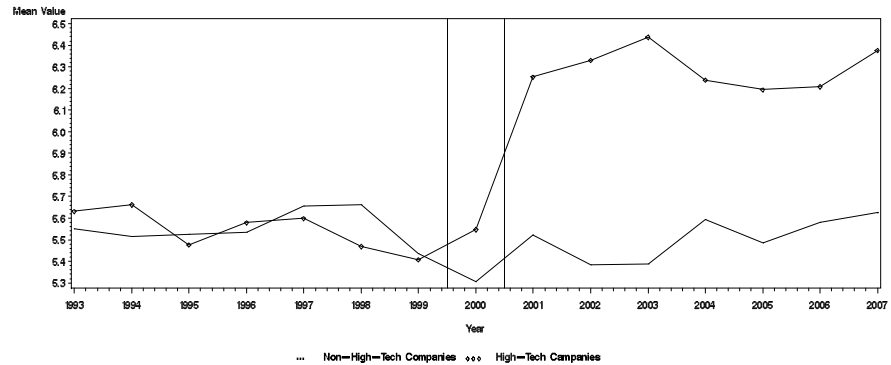


However, the mean value of receivable turnover rates had an opposite phenomenon before and after the bubble. In Graph 2, the high-tech and the non-high-tech rates were mixed before the bubble. The high-tech became much higher than the non-high-tech after the year 2000.

Trends of the mean value of gross profits and inventory turnover ratios for high-tech and non-high-tech companies have indicated continuous upward trends in the study period before and after the high-tech bubble. In those ratios, the high-tech companies' financial ratios were higher

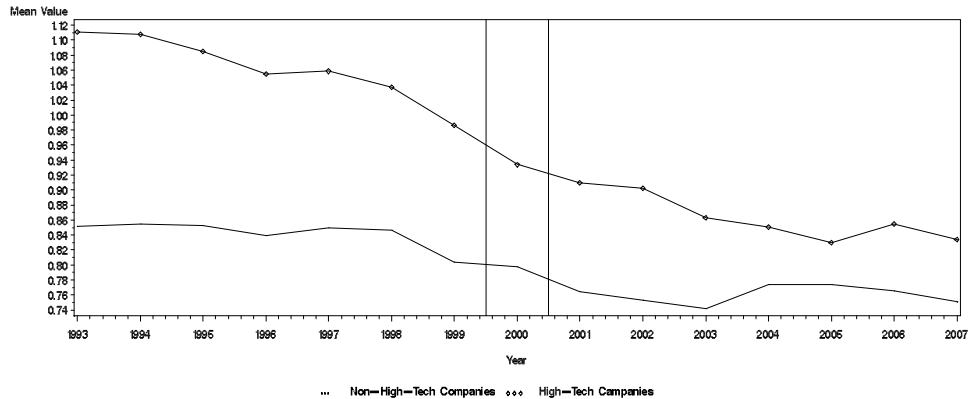
than the non-high-tech companies. Trends of return on assets ratios, fixed-asset turnover ratios, and price-earning ratios have shown larger fluctuations after the high-tech bubble in the study period. Their high-tech companies' financial ratios were higher than the non-high-tech ones.

Mean Value of Receivables Turnover Ratio



Total assets turnover ratios have been declining throughout the entire period as shown in Graph 3. Dividend-to-price and total-debt-to-total-assets ratios have shown the opposite results - the non-high-tech companies' ratios were higher than the high-tech ones.

Mean Value of Total Assets Turnover Ratio



VI. Size-Effect

The market capitalization may be an important factor in influencing companies' performances before and after the high-tech bubble. Table III tabulates the means and slope for the small and large companies before and after the high-tech bubble.

In profitability rankings, large high-tech companies usually have a higher profit than small companies. Large high-tech companies have reduced the profit gaining power after the bubble, but the small high-tech companies are still profitable. Small high-tech companies' ROA and ROE have reduced slightly, but the large companies' slopes have changed more significantly after the bubble.

As for the assets utilization ratio ranking, the small high-tech companies were more sensitive than large high-tech companies after the bubble. Similar outcomes have been observed for non-high-tech companies. The high-tech and non-high-tech companies have more impact in terms of slope on the ratios than small companies after the bubble.

In the category of liquidity ratio ranking, we observed higher mean values in the non-high-tech companies. Both small and large NWTAs mean values have changed after the bubble, indicating that the larger high-tech companies have reduced their short-term debt and the small high-tech companies have reduced inventory after the bubble.

The results showed that large high-tech and non-high-tech companies had larger debt utilization ratios after the bubble. The size-effect of debt utilization did not show a clear impact on the high-tech companies. In terms of long-term debt, the large non-high-tech companies were more conservative after the bubble and reduced long-term debt substantially. However, the small non-high-tech companies had less ability to reduce the long-term debt.

The large high-tech and non-high-tech companies had higher mean values of the price to earning ratio rankings because of their awareness and reputation even after the bubble. The earnings had reduced more than prices on large high-tech and non-high tech companies' aftermath.

VII. Structure Change Before and After High-Tech Bubble Burst

Table IV provides price ratios information about the non-linear regression of the structure change before and after the high-tech bubble. Overall, models include the independent variables of ranks in profits, assets, liquidities, and debts for all sample companies, both high-tech and non-high-tech.

The Chow test is also used in this time series analysis to test for the presence of a structural change. In this financial evaluation, the Chow test value is used to determine whether the independent variables have different impacts on different subgroups of all companies. The results of market to book value's Model 1 and Model 2 showed that F-value of the Chow Test was 6.69 and P-value was less than 0.0001, indicating that before and after the high-tech bubble, all companies' financial ratios have significantly changed. Asset and debt indices have become significant after the high-tech bubble occurred. However, the squared terms became insignificant for all samples.

When observing the market to book value of high-tech companies, we found that the profit index was the only one showing significant differences. The liquidity index became insignificant after the bubble. All four factors remained significant for non-high-tech companies.

We further examined price-equity ratio and found that the liquidity index had become insignificant for all companies after the bubble. For the high-tech companies, profit and debt indices remained significant while squared terms profit and asset indices also remained significant after the bubble.

For the price to equity ratio on non-high-tech companies, profit and debt indices remained significant after the bubble. However, the liquidity index became insignificant after the bubble. The squared terms of profit and debt indices remained or became significant afterward, but not on asset and liquidity indices.

In the short-term effect, the results showed that price to earning ratios have reduced first and then increased later after the bubble. High-tech companies had more profit impact than non-high-tech companies in the aftermath. The coefficients after the bubble have become higher than before, showing that the investors have weighted profitability ratios as more important than other factors for their investments.

In general, the squared terms of profitability ratios were higher on the non-high-tech companies than on the high-tech companies. This indicated that the non-high-tech companies have turned around faster than the high-tech companies after the bubble. Investors have used the profitability ratios on non-high-tech companies' investment more frequently than before the bubble.

The positive correlations between asset utilization ratio and profitability ratio have turned to a negative correlation after the bubble. It means that the reduction of inventory, receivables, and sale of assets would shrink the liability. With the reduced liability, asset utilization ratios will reduce too. Investors would have a perception of the performance of the company. Since these coefficients had relatively small values, the effects of assets utilization were not as important as the previous one.

When observing the liquidity ratio composite rankings, we found that many companies have structured the way they deal with the debt much better after the bubble. Investors have paid more attention to this issue after the event. However, the high-tech companies have not had significant influence either before or after the bubble.

The outcomes of debt ratio composite rankings have shown that the negative correlation coefficients become even larger after the bubble. This can be observed on the non-high-tech companies. The coefficient of high-tech companies has changed the sign from positive to negative after the bubble. In other words, investors have paid more attention to the debt-ratios after the bubble.

Market to book value ratios would show the companies' long-term outcomes. The profitability composite ratio ranking has shown the largest change among the coefficients: the ratios have become larger after the bubble. The high-growth companies will have high profit rankings and such high-growth stocks will have high MB ratios. After the bubble, the profit was more sensitive to the investors, and decisions of investors have become more reasonable and sensitive.

In the market to book value ratios, the asset composite ratio ranking had a larger coefficient after the bubble in the first-degree term. However, the coefficient of the squared term became insignificant, showing that investors became more normative. This effect has been observed among the non-high-tech investors.

The liquidity ratio composite ranking in the market to book ratio would show the short-term effect of companies' performances. After the bubble, the coefficients of the liquidity have become less significant. The squared term has shown this outcome even more clearly.

The negative coefficients of debt ratio composite ranking in this model have shown more significant outcomes. In the long run, the increase of debt will increase the tax field effect, decrease weighted average cost of capital, and increase after-tax profit. The coefficients were more significant for the non-high-tech companies than the high-tech companies.

VIII. Conclusion

The results showed that the insignificant sales changes proved that the non-high-tech short-term liability has been declining after the period of the bubble. In general, the non-high-tech companies have more impact on profitability after the bubble. The profitability, sales, and long-term equity have higher volatility and risk after the year 2000. We observed that the non-high-tech companies are more conservative than the high-tech companies.

The high-tech companies have reduced more cost than the non-high-tech companies. This phenomenon indicated that the proportion of net income among high-tech companies has grown more than their assets and equities. The trend has shown a strong recovery after the bubble. The high-tech companies have a higher efficiency level than non-high-tech companies after the effect of the high-tech bubble. On the whole, the non-high-tech companies had a lower declining rate or they were more mature than the high-tech companies.

The size-effect analysis showed that large high-tech companies have reduced the profit gaining power after the bubble, but the small high-tech companies were still profitable. The study indicated that the larger high-tech companies have reduced their short-term debt and the small high-tech companies have reduced their inventories after the bubble. In terms of long-term debt, the large non-high-tech companies were more cautious after the bubble and reduced long-term debt substantially. However, the small non-high-tech companies had less ability to reduce long-term debt. The earnings have reduced more than the prices on large high-tech and non-high tech companies after the bubble.

The regression results indicated that the non-high-tech companies have turned around faster than the high-tech companies after the bubble. Investors have used the profitability ratios on non-high-tech companies' investment more frequently than before the bubble. Many companies have structured the way they can deal with the debt much better after the bubble. Investors have paid more attention to this issue after the event. However, the high-tech companies have not had significant influence either before or after the bubble. Investors also have paid more attention to the debt-ratios after the bubble. The large high-tech and non-high-tech companies had higher price to earning ratio rankings because of their awareness and reputation even after the bubble. The earnings have reduced more than the prices in both large

high-tech and large non-high tech companies' aftermath. Generally, aftermath companies have changed most of their focus from revenue-oriented measures to profitability assessment, asset utilization, and debt burden.

Table I: Descriptive Statistics

This table displays the descriptive statistics of the most important financial ratios in our database. PM is Gross Profit Margin Ratio, ROA is Return on Assets Ratio, ROE is Return on Equity Ratio, RT is Receivables Turnover Ratio, IT is Inventory Turnover Ratio, FAT is Fixed Assets Turnover Ratio, TATO is Total Assets Turnover Ratio, CR is Current Ratio, QR is Quick Ratio, NWT A is Net Working Capital to Total Assets Ratio, LTDE is Long-term Debt to Equity ratio, TDTA is Total Debt to Total Assets Ratio, PE is Price to Earnings Ratio, and MB is Market to Book Value Ratio.

Panel A: Pre-High-Tech Bubble Burst (High-Tech Companies)				
Ratios	Mean	Std. Dev.	Min.	Max.
PM	0.4838	0.0132	0.4668	0.5061
ROA	0.0880	0.0020	0.0840	0.0900
ROE	0.1488	0.0035	0.1428	0.1526
RT	5.5457	0.0957	5.4063	5.6612
IT	14.3448	0.8439	13.3110	15.6627
FAT	4.3471	0.0970	4.1852	4.4657
TATO	1.0630	0.0437	0.9864	1.1110
CR	3.3514	0.1087	3.2344	3.4995
QR	2.7372	0.1136	2.5571	2.8769
NWT A	0.4154	0.0156	0.3954	0.4340
LTDE	0.1641	0.0123	0.1460	0.1772
TDTA	0.3585	0.0102	0.3399	0.3707
PE	19.5788	2.1353	16.4452	23.4005
MB	3.6101	0.4389	3.0899	4.4486

Panel B: Post-High-Tech Bubble Burst (High-Tech Companies)				
Ratios	Mean	Std. Dev.	Min.	Max.
PM	0.5247	0.0133	0.4994	0.5391
ROA	0.0800	0.0040	0.0747	0.0871
ROE	0.1395	0.0099	0.1292	0.1587
RT	6.2911	0.0917	6.1946	6.4372
IT	16.2810	1.2553	13.8298	17.8516
FAT	3.9644	0.1682	3.7540	4.2418
TATO	0.8635	0.0312	0.8300	0.9096
CR	3.4062	0.1107	3.3361	3.6493
QR	2.9207	0.0721	2.8225	3.0494
NWT A	0.3777	0.0140	0.3663	0.4072
LTDE	0.1755	0.0062	0.1664	0.1840
TDTA	0.3523	0.0080	0.3400	0.3640
PE	21.9535	3.3542	16.6970	25.7231
MB	3.3224	0.3087	2.7023	3.6757

Table I (Continued): Descriptive Statistics

Panel C: Pre-High-Tech Bubble Burst (Non-High-Tech Companies)				
Ratios	Mean	Std. Dev.	Min.	Max.
PM	0.3751	0.0061	0.3692	0.3854
ROA	0.0542	0.0012	0.0520	0.0555
ROE	0.1407	0.0028	0.1386	0.1466
RT	5.5540	0.0806	5.4356	5.6631
IT	18.5897	1.4111	16.0606	20.5927
FAT	3.6805	0.0237	3.6383	3.7071
TATO	0.8425	0.0178	0.8040	0.8551
CR	2.3722	0.0818	2.2174	2.4546
QR	1.6842	0.0756	1.5558	1.7705
NWTA	0.1721	0.0108	0.1488	0.1807
LTDE	0.3890	0.0327	0.3537	0.4459
TDTA	0.5391	0.0096	0.5303	0.5580
PE	14.2151	1.7301	12.1056	17.3068
MB	2.3298	0.1119	2.1945	2.4984
Panel D: Post-High-Tech Bubble Burst (Non-High-Tech Companies)				
Ratios	Mean	Std. Dev.	Min.	Max.
PM	0.4133	0.0182	0.3895	0.4353
ROA	0.0542	0.0054	0.0475	0.0605
ROE	0.1426	0.0082	0.1324	0.1532
RT	5.5107	0.0972	5.3835	5.6249
IT	20.6928	0.3979	20.1497	21.3603
FAT	3.5892	0.1439	3.4132	3.7371
TATO	0.7606	0.0121	0.7415	0.7738
CR	2.3148	0.0750	2.1968	2.3979
QR	1.7227	0.1015	1.5634	1.8306
NWTA	0.1500	0.0107	0.1370	0.1603
LTDE	0.4186	0.0230	0.3940	0.4460
TDTA	0.5408	0.0095	0.5293	0.5530
PE	16.0375	1.5795	13.7018	17.7537
MB	2.4273	0.2669	1.9837	2.6669

Table II: Comparison of Means and Slopes Before and After the High-Tech Bubble Burst (HTB) for All Companies

T-statistics are calculated by using a pooled difference of means test, F-statistics are for a Chow test

* Significant at the 10 percent level (two-tailed)

** Significant at the 5 percent level (two-tailed)

*** Significant at the 1 percent level (two-tailed)

Panel A: High-Tech Companies						
Ratios Successive Quarter	Mean			Slope		
	Pre-HTB	Post-HTB	<i>t</i> -statistic for difference	Pre-HTB	Post- HTB	<i>F</i> -statistic for difference
PM	0.4838	0.5247	5.77***	0.0057	0.0028	0.79
ROA	0.0880	0.0800	-4.71***	0.0003	0.0010	7.08**
ROE	0.1488	0.1395	-2.36***	0.0010	0.0029	5.89**
RT	5.5457	6.2911	14.88***	-0.0335	-0.0041	39.04***
IT	14.3448	16.2810	3.39***	0.3645	0.1397	0.38
FAT	4.3471	3.9644	-5.21***	-0.0122	0.0710	22.51***
TATO	1.0630	0.8635	-9.83***	-0.0194	-0.0126	9.06***
CR	3.3514	3.4062	0.93	-0.0015	-0.0302	1.45
QR	2.7372	2.9207	3.61***	0.0256	-0.0121	1.83
NWTA	0.4154	0.3777	-4.76***	-0.0026	-0.0046	0.30
LTDE	0.1641	0.1755	2.18**	0.0027	-0.0002	0.63
TDTA	0.3585	0.3523	-1.26	0.0002	0.0029	2.15
PE	19.5788	21.9535	1.58	0.6053	0.3635	0.15
MB	3.6101	3.3224	-1.42	0.1608	0.0154	4.94**
Panel B: Non-High-Tech Companies						
Ratios Successive Quarter	Mean			Slope		
	Pre-HTB	Post-HTB	<i>t</i> -statistic for difference	Pre-HTB	Post- HTB	<i>F</i> -statistic for difference
PM	0.3751	0.4133	5.25***	0.0001	-0.0017	3.35*
ROA	0.0542	0.0542	0.00	-0.0002	0.0023	17.77***
ROE	0.1407	0.1426	0.59	0.0009	0.0035	14.25***
RT	5.5540	5.5107	-0.91	0.0029	0.0285	2.00
IT	18.5897	20.6928	3.80***	0.5955	0.1191	6.95**
FAT	3.6805	3.5892	-1.66	-0.0035	0.0611	28.67***
TATO	0.8425	0.7606	-10.07***	-0.0058	0.0007	8.83***
CR	2.3722	2.3148	-1.37	-0.0266	0.0335	12.19***
QR	1.6842	1.7227	0.80	-0.0224	0.0458	14.29***
NWTA	0.1721	0.1500	-3.84***	-0.0038	0.0045	16.91***
LTDE	0.3890	0.4186	1.96*	0.0137	-0.0100	25.67***
TDTA	0.5391	0.5408	0.34	0.0028	-0.0042	9.38***
PE	14.2151	16.0375	2.06**	0.0191	0.3491	0.27
MB	2.2783	2.4273	1.19	0.0079	0.0855	1.31

Table III: Comparison of Means and Slopes Before and After the High-Tech Bubble Burst for Small Size Companies

Stocks listed in NYSE, AMEX, and NASDAQ that have the required CRSP-COMPUSTST data are then allocated to three size portfolios based on the NYSE deciles breakpoints, divided at the 3rd and the 7th deciles breakpoint.

T-statistics are calculated by using a pooled difference of means test, F-statistics are for a Chow test

* Significant at the 10 percent level (two-tailed)

** Significant at the 5 percent level (two-tailed)

*** Significant at the 1 percent level (two-tailed)

Panel A: High-Tech Companies						
Ratios	Mean			Slope		
Successive Quarter	Pre-HTB	Post-HTB	<i>t</i> -statistic for difference	Pre-HTB	Post-HTB	<i>F</i> -statistic for difference
PM	0.4692	0.5049	4.66 ^{***}	0.0038	0.0038	0.06
ROA	0.0827	0.0768	-2.90 ^{***}	-0.0005	0.0010	2.66
ROE	0.1344	0.1257	-2.18 ^{**}	-0.0011	0.0019	2.08
RT	5.5076	6.2628	8.10 ^{***}	-0.0658	-0.0213	9.04 ^{***}
IT	13.3245	15.1098	2.95 ^{***}	0.2790	0.2603	0.04
FAT	4.5936	4.2729	-3.82 ^{***}	-0.0198	0.0853	24.09 ^{***}
TATO	1.1153	0.9275	-9.22 ^{***}	-0.0139	-0.0184	5.23 ^{**}
CR	3.5297	3.6410	1.53	-0.0122	-0.0059	0.56
QR	2.8105	3.0753	3.95 ^{***}	0.0015	0.0239	0.74
NWTA	0.4439	0.4154	-3.21 ^{***}	-0.0037	-0.0022	0.09
LTDE	0.1432	0.1351	-1.04	0.0041	-0.0027	2.06
TDTA	0.3412	0.3273	-2.56 ^{***}	0.0014	0.0008	1.54
PE	17.2877	20.3411	1.90	0.1608	0.7778	0.80
MB	2.8958	2.8122	-0.45	-0.0384	0.0954	1.38
Panel B: Non-High-Tech Companies						
Ratios	Mean			Slope		
Successive Quarter	Pre-HTB	Post-HTB	<i>t</i> -statistic for difference	Pre-HTB	Post-HTB	<i>F</i> -statistic for difference
PM	0.4248	0.3764	5.46 ^{***}	-0.0005	-0.0022	3.99 [*]
ROA	0.0487	0.0516	-1.59	-0.0005	0.0018	15.10 ^{***}
ROE	0.1237	0.1289	-2.46 ^{**}	-0.0010	0.0016	6.90 ^{**}
RT	5.0268	5.3145	-4.61 ^{***}	0.0056	0.0209	3.71 [*]
IT	20.8291	18.5461	3.55 ^{***}	0.5947	0.3747	3.47 [*]
FAT	3.8818	4.0387	-2.03 ^{**}	-0.0026	0.0892	54.08 ^{***}
TATO	0.7423	0.8566	-10.97 ^{***}	-0.0068	0.0009	10.14 ^{***}
CR	2.6549	2.6208	0.58	-0.0216	0.0597	16.59 ^{***}
QR	1.9767	1.8616	1.67	-0.0248	0.0737	22.51 ^{***}
NWTA	0.1705	0.1951	-3.46 ^{***}	-0.0037	0.0057	11.86 ^{***}
LTDE	0.3935	0.3538	2.43 ^{**}	0.0142	-0.0112	23.00 ^{***}
TDTA	0.5280	0.5243	0.54	0.0024	-0.0064	9.39 ^{***}
PE	15.6431	13.2423	2.28 [*]	-0.0952	0.6067	0.97
MB	2.0731	1.9229	0.99	-0.0493	0.0984	2.44

Table III (continued): Comparison of Means and Slopes Before and After the High-Tech Bubble Burst for Large Size Companies

Panel A: High-Tech Companies						
Ratios	Mean			Slope		
Successive Quarter	Pre-HTB	Post-HTB	<i>t</i> -statistic for difference	Pre-HTB	Post-HTB	<i>F</i> -statistic for difference
PM	0.5384	0.5834	5.27***	0.0066	0.0031	0.64
ROA	0.1045	0.0916	-2.62***	0.0020	0.0036	8.22***
ROE	0.2076	0.1902	-1.55	0.0031	0.0084	5.27**
RT	5.6722	6.5466	7.24***	0.0471	0.0887	1.53
IT	17.4568	19.8505	2.19**	0.8714	-0.1692	2.74
FAT	3.1078	3.1143	0.04	0.1349	0.0821	7.41**
TATO	0.9177	0.7235	-8.18***	-0.0165	0.0010	5.17**
CR	2.2727	2.5458	2.04**	0.0979	-0.0443	3.33*
QR	1.9437	2.2611	2.21**	0.1207	-0.0409	4.44**
NWTA	0.2631	0.2638	0.04	0.0153	-0.0039	5.28**
LTDE	0.2503	0.2580	0.51	-0.0073	-0.0034	1.32
TDTA	0.4562	0.4307	-1.92*	-0.0102	0.0018	2.31
PE	26.3107	26.3043	0.00	0.6053	0.3635	10.31***
MB	5.2460	4.7670	-1.13	0.4418	-0.1387	21.15***
Panel B: Non-High-Tech Companies						
Ratios	Means			Slope		
Successive Quarter	Pre-HTB	Post-HTB	<i>t</i> -statistic for difference	Pre-HTB	Post-HTB	<i>F</i> -statistic for difference
PM	0.4004	0.3824	4.30***	0.0015	-0.0002	1.19
ROA	0.0631	0.0568	1.73	0.0002	0.0043	36.65***
ROE	0.1935	0.1813	1.64	0.0042	0.0074	16.93***
RT	6.3768	6.0036	2.93***	-0.0792	0.0946	9.62***
IT	19.8493	18.1190	2.88***	0.4491	-0.4490	17.27***
FAT	3.0299	2.5781	8.36***	0.0258	0.0352	2.27
TATO	0.7274	0.7455	-1.50	-0.0101	0.0047	5.74**
CR	1.5238	1.4826	1.98*	-0.0038	0.0115	1.20
QR	1.1171	1.0043	5.10***	0.0030	0.0164	1.34
NWTA	0.0794	0.0755	1.20	-0.0013	0.0032	15.02***
LTDE	0.5045	0.5285	-1.58	0.0072	-0.0160	35.02***
TDTA	0.5961	0.6095	-3.02***	0.0017	-0.0046	20.48***
PE	17.2553	17.2773	-0.02	0.7016	-0.5092	5.07**
MB	3.3618	3.2904	0.41	0.1806	0.0380	10.57***

Table IV: Structure Change Before and After the High-Tech Bubble Burst

The market to book value ratio is the dependent variables in the panel A. Models 1 and 2 represent the entire sample companies before and after high-tech bubble, respectively, for all 52,895 companies. Models 3 and 4 represent the high-tech companies only before and after high-tech bubble, respectively, for 9,480 companies or 18.93 percent of the total. Models 5 and 6 represent the non-high-tech companies before and after high-tech bubble for 43,415 companies or 82.08 percent of the total.

Panel A: Regression for Market to Book Value Ratio

	MODEL1	MODEL2	MODEL3	MODEL4	MODEL5	MODEL6
Intercept	1.437 ^{***} (12.87)	0.941 ^{***} (7.23)	1.342 ^{***} (5.13)	0.959 ^{***} (3.23)	1.425 ^{***} (11.45)	0.897 ^{***} (6.16)
Profit rank	0.437 ^{***} (14.62)	0.609 ^{**} (17.44)	0.349 ^{***} (5.80)	0.512 ^{**} (7.22)	0.458 ^{***} (13.25)	0.637 ^{***} (15.85)
Asset rank	0.057 (1.47)	0.131 ^{**} (2.92)	0.009 (0.11)	0.109 (1.12)	0.075 [*] (1.74)	0.147 ^{***} (2.90)
Liquids rank	-0.109 ^{***} (-4.55)	-0.056 ^{**} (-2.03)	-0.124 ^{**} (-2.46)	0.010 (0.18)	-0.108 ^{***} (-3.91)	-0.087 ^{***} (-2.71)
Debt rank	-0.033 (-1.21)	-0.178 ^{***} (-5.69)	0.012 (0.19)	-0.146 [*] (-1.93)	-0.039 (-1.32)	-0.172 ^{***} (-5.02)
Profit rank ²	0.025 ^{***} (6.86)	0.010 [*] (2.41)	0.031 ^{***} (4.25)	0.022 ^{***} (2.61)	0.024 ^{***} (5.74)	0.007 (1.40)
Asset rank ²	0.010 ^{**} (2.05)	0.004 (0.68)	0.017 [*] (1.65)	-0.005 (-0.45)	0.007 (1.36)	0.006 (0.90)
Liquids rank ²	0.007 ^{**} (2.37)	0.001 (0.19)	0.021 ^{***} (3.38)	-0.003 (-0.38)	0.003 (0.88)	0.003 (0.76)
Debt rank ²	0.019 ^{***} (6.00)	0.038 ^{***} (10.66)	0.015 ^{**} (2.06)	0.039 ^{***} (4.77)	0.020 ^{***} (5.82)	0.036 ^{***} (9.06)
Adjusted R ²	24.26%	30.63%	22.81%	30.04%	25.15%	31.10%
N	30,864	22,031	5,525	3,955	25,339	18,076
F Value-Chow Test	6.69 ^{***}		5.18 ^{***}		5.25 ^{***}	
P Value-Chow Test	<.0001		<.0001		<.0001	

Panel B: Regression for Price to Earnings Ratio

	MODEL1	MODEL2	MODEL3	MODEL4	MODEL5	MODEL6
Intercept	8.258 ^{***} (70.58)	8.518 ^{***} (60.82)	7.309 ^{***} (27.46)	7.873 ^{***} (25.86)	8.508 ^{***} (64.69)	8.618 ^{***} (54.17)
Profit rank	-1.307 ^{***} (-41.71)	-1.168 ^{***} (-31.13)	-1.373 ^{***} (-22.41)	-1.201 ^{***} (-16.53)	-1.293 ^{***} (-35.40)	-1.155 ^{***} (-26.27)
Asset rank	-0.045 (-1.10)	-0.069 (-1.42)	0.075 (0.87)	0.100 (1.00)	-0.074 (-1.61)	-0.107 [*] (-1.93)
Liquids rank	-0.088 ^{***} (-3.49)	0.011 (0.37)	-0.039 (-0.76)	0.071 (1.24)	-0.117 ^{***} (-4.03)	-0.016 (-0.45)

Debt rank	-0.070** (-2.48)	-0.308*** (-9.14)	0.115* (1.74)	-0.130* (-1.69)	-0.115*** (-3.64)	-0.336*** (-8.94)
Profit rank ²	0.105*** (27.93)	0.081*** (18.02)	0.112*** (15.23)	0.075*** (8.53)	0.104*** (23.63)	0.084*** (15.84)
Asset rank ²	-0.016*** (-3.19)	-0.013** (-2.27)	-0.028*** (-2.69)	-0.038*** (-3.14)	-0.013** (-2.28)	-0.007 (-1.03)
Liquids rank ²	0.010*** (3.17)	-0.002 (-0.50)	0.020*** (3.23)	0.001 (0.13)	0.008*** (2.33)	-0.002 (-0.39)
Debrank ²	-0.008* (-2.31)	0.017*** (4.50)	-0.027*** (-3.67)	0.000 (-0.05)	-0.001 (-0.38)	0.021*** (4.74)
Adjusted R ²	16.48%	19.55%	19.76%	26.37%	15.95%	17.39%
N	30,864	22,031	5,525	3,955	25,339	18,076
<i>F</i> Value- Chow Test	5.41		6.29		7.76	
<i>P</i> Value- Chow Test	<.0001		<.0001		<.0001	

Appendix I

Industries Identified as High-Growth High-Tech Companies During 1/1/1998 – 3/31/2000

Industry Group **283**: Drugs

- 2833 Medicinal Chemicals and Botanical Products
- 2834 Pharmaceutical Preparations
- 2835 In Vitro and In Vivo Diagnostic Substances
- 2836 Biological Products, Except Diagnostic Substances

Industry Group **357**: Computer and Office Equipment

- 3571 Electronic Computers
- 3572 Computer Storage Devices
- 3575 Computer Terminals
- 3577 Computer Peripheral Equipment, Not Elsewhere Classified
- 3578 Calculating and Accounting Machines, Except Electronic Computers
- 3579 Office Machines, Not Elsewhere Classified

Industry Group **366**: Communications Equipment

- 3661 Telephone and Telegraph Apparatus
- 3663 Radio and Television Broadcasting and Communications Equipment
- 3669 Communications Equipment, Not Elsewhere Classified

Industry Group **367**: Electronic Components and Accessories

- 3671 Electron Tubes
- 3672 Printed Circuit Boards
- 3674 Semiconductors and Related Devices
- 3675 Electronic Capacitors

- 3676 Electronic Resistors
- 3677 Electronic Coils, Transformers, and Other Inductors
- 3678 Electronic Connectors
- 3679 Electronic Components, Not Elsewhere Classified

Industry Group **382**: Laboratory Apparatus and Analytical, Optical, Measuring, and Controlling Instruments

- 3821 Laboratory Apparatus and Furniture
- 3822 Automatic Controls for Regulating Residential and Commercial Environments and Appliances
- 3823 Industrial Instruments for Measurement, Display, and Control of Process Variables; and Related Products
- 3824 Totalizing Fluid Meters and Counting Devices
- 3825 Instruments for Measuring and Testing of Electricity and Electrical Signals
- 3826 Laboratory Analytical Instruments
- 3827 Optical Instruments and Lenses
- 3829 Measuring and Controlling Devices, Not Elsewhere Classified

Industry Group **481**: Telephone Communications

- 4812 Radiotelephone Communications
- 4813 Telephone Communications, Except Radiotelephone

Industry Group **573**: Radio, Television, Consumer Electronics, and Music Stores

- 5731 Radio, Television, and Consumer Electronics Stores
- 5734 Computer and Computer Software Stores
- 5735 Record and Pre-recorded Tape Stores
- 5736 Musical Instrument Stores

Industry Group **737**: Computer Programming, Data Processing, And Other Computer Related Services

- 7371 Computer Programming Services
- 7372 Prepackaged Software
- 7373 Computer Integrated Systems Design
- 7374 Computer Processing and Data Preparation and Processing Services
- 7375 Information Retrieval Services
- 7376 Computer Facilities Management Services
- 7377 Computer Rental and Leasing
- 7378 Computer Maintenance and Repair
- 7379 Computer Related Services, Not Elsewhere Classified

Industry Group **873**: Research, Development, and Testing Services

- 8731 Commercial Physical and Biological Research
- 8732 Commercial Economic, Sociological, and Educational Research
- 8733 Noncommercial Research Organizations
- 8734 Testing Laboratories

Industry Group **355**: Special Industry Machinery, Except Metalworking

- 3552 Textile Machinery
- 3553 Woodworking Machinery
- 3554 Paper Industries Machinery
- 3555 Printing Trades Machinery and Equipment
- 3556 Food Products Machinery
- 3559 Special Industry Machinery, Not Elsewhere Classified

Industry Group **365**: Household Audio and Video Equipment, And Audio

- 3651 Household Audio and Video Equipment
- 3652 Phonograph Records and Prerecorded Audio Tapes and Disks

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