Technology Valuations Pre and Post-Tech Boom

My focus has been to analyze how valuation has changed before and after the tech boom. It seems today that many companies which make very little money are valued very high and I was interested in analyzing whether this trend truly exists, whether this has always been the case, or whether accounting standards have changed so much so that the valuations are on par with other companies based on earnings. I have compiled yearly data from FactSet from 1990 through 2021, created a new profitability-determining number based on an adjusted-EBIT, calculated to determine which companies were profitable and which ones were unprofitable. I compared the average and median Enterprise Value-to-Sales multiple (EV/Sales) for profitable and unprofitable companies in the same industry based on Revere Business Industry Classifications System (RBICS) over two time periods: Pre-Tech Boom (prior to March 10th, 2000) and Post-Tech Boom (following March 10th, 2000. Our results showed evidence that unprofitability was treated with a higher EV/Sales multiple in the Pre-Tech Boom period rather than in the Post-Tech Boom period.

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# Introduction

## Changes in Profitability

How has valuation changed in the time since the 2000 Dot Com Bubble burst? It seems that now, more than ever, tech companies with very negative net income receive significant valuations, but perhaps this is rather an issue with the way net income is calculated as compared to whether these unprofitable companies deserve such a valuation. For example, in years past, a mining company would buy equipment that would increase its future output and growth, charge it to its balance sheet and slowly depreciate it away. However, in today’s modern era, tech companies put few resources in hard assets, but invest heavily in Research and Development or put money towards creating network effects through Sales and Marketing expenditure. Both these expenses act similarly to the expenditure done by a mining company in that they grow future potential, but they are accounted for distinctly. It is possible that company profitability is the same as it always was, but a change in industry composition has led to a higher proportion of firms reporting losses due to conservative accounting conventions.

To mitigate the effects of this change in industry composition over time, I opted to evaluate profitability on an adjusted-EBIT basis. By evaluating on this basis, we can focus more so on the company’s cash flow (since EBIT can serve as a good proxy for cash flow), but also adjust it to get our desired results and eliminate the major effects of capital structure from profitability analysis since the time changes may make certain capital structures better at certain points in time. The Adjusted EBIT Equation was as follows:

$$Adjusted EBIT=EBIT+R\&D Expense+0.5×Marketing Expense$$

The basis for this calculation was to add back R&D fully since this expense serves more so as a long-term value driver for the company like PP&E but is immediately expensed as a part of the EBIT calculation. Reversing this expense can give a better idea of profitability without being tarnished for future growth. There was also research done by Aswath Damodaran on R&D expense and how it should be added back for more effective valuation of companies[[1]](#footnote-1).

The 50% Marketing expense was a more generalized add back. Certain marketing expenses by companies nowadays are growth-focused such as promotions to incentivize new customers (as is often done with companies like DoorDash). However, since not all marketing expenses can be attributed to growth, I used 50% as a generalization for how much of marketing expense really drives future growth. It may be the case for some companies it is closer to 100% and for others it is closer to 0%, but there is limited research on the subject, so instead I relied on taking a seeming average of both ends with 50%.

## Relevance to Investing Today

As more and more speculative opportunities become available and companies with very limited earnings (i.e., Tesla or Uber) gain enormous valuations, the question left to be asked is if this is justified for such companies? If it turns out that in the past, people were just as bullish on unprofitable companies, it paints a picture that perhaps the current valuations for tech are not really a bubble and perhaps these companies spending in R&D and Marketing will truly give them an edge that justifies their valuation. Of course, the results will likely not be 100% generalizable to all companies with negative net income, but it may show that perhaps as a whole, a bubble may not necessarily be forming around tech and other industries. The critical date is March10th, 2000, when the NASDAQ reached its peak right before the bubble burst.

To effectively analyze this, I will compare EV/Sales multiples previous to this date for profitable and unprofitable companies and after this date for profitable and unprofitable companies. Then, I will analyze by industry and determine any significant changes in multiples since then by comparing Median and Mean EV/Sales multiples. The Sales multiple was primarily chosen since P/E is affected by other factors of interest and other random expenses that we are not trying to keep relevant, and an EBIT or EBITDA multiple did not make sense since we are using an adjusted version to determine profitability. So, EV/Sales made the most sense to move forward for analysis.

# Method and data

To start, an initial screen was created on FactSet that included active and inactive NASDAQ- and NYSE-listed companies. This led to approximately 13,634 companies that could potentially be analyzed. I chose the NYSE and NASDAQ as these are the two biggest and most relevant exchanges in the United States. The NYSE serves well as a very varied exchange whereas the NASDAQ works well in being slightly more tech-focused, so in this way, both exchanges together can provide a lot of meaningful data.

Data for each of these companies was needed in the specific time frame of 1990 through 2021 (if available), collecting annual data. The reason for this time period was primarily because I wanted as much recent data as possible, but also wanted enough tech companies from the past. Although it would have been preferable to have 20 years of data pre and post-tech boom, the 1980s to 90s may not have many tech companies, so 1990 made more sense as a starting point. Yearly data was needed for the key variables in Table 2. Key Variables, so using the current date, I retrieved data from each year for each of the companies.

Since there were a number of inactive companies during the period or multiple new companies that have not yet had a whole fiscal year of sales, a large portion of the 13,634 were filtered out since they had no viable data as shown in Table 1. Data. Each piece of annual data was treated as its own for each company. Below is a table specifying describing the data.

Table 1. Data

|  |  |  |  |
| --- | --- | --- | --- |
| **# of Observations** | **# of Companies** | **Start Date of Data** | **End Date of Data** |
| 10,297 | 1,880 | 11/21/1990 | 11/21/2021 |

For each of these companies and observations, there were many key variables that I analyzed, below is a table with examples of that data:

Table 2. Key Variables

|  |  |
| --- | --- |
| **Key Variable** | **Example Data** |
| Company | Apple Inc. |
| Ticker/Symbol | AAPL |
| RBICS | Technology |
| Year (Multiple years of data collected, each is treated individually) | 2002 |
| EBIT | 46 |
| R&D Expense | 446 |
| Marketing Expense | 209 |
| EV/Sales | 0.23 |

In Table 3. Descriptive statistics I show descriptive statistics. Below, is a summary of my observations. It is of key importance to look at the EBIT, the adjusted EBIT, and the EV/Sales numbers as they can provide a lot of interesting analysis. The data shows how profitable observations in the pre-boom era are significantly higher with the 50th percentile being 88.57 for adjusted EBIT and with a high median multiple of 1.44x, but one that is higher with unprofitable observations before the tech boom with 6.80x. In general, the data shows that valuations were higher for profitable and unprofitable companies before the boom. Interestingly, profitable companies had higher highs and lower lows of spending in R&D with 25th percentile being 0, but the 75th percentile being 37.47 and 30.53, which is higher than the post boom 17.40 and 11.53.

Table 3. Descriptive Statistics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cohort** | **Profitable Observations Based on Adjusted EBIT (Pre-March 10th, 2000)** | **Profitable Observations Based on Adjusted EBIT (Post-March 10th, 2000)** | **Unprofitable Observations Based on Adjusted EBIT (Pre-March 10th, 2000)** | **Unprofitable Observations Based on Adjusted EBIT (Post-March 10th, 2000)** |
| Observations | 1,656 | 7,085 | 242 | 1,314 |
| EBIT ($m) |
| 25th perc | 13.88 | 2.41 | -64.31 | -33.07 |
| 50th perc | 54.29 | 19.84 | -28.69 | -13.85 |
| 75th perc | 255.51 | 96.09 | -12.55 | -5.74 |
| R&D ($m) |
| 25th perc | 0 | 0 | 2.29 | 0.11 |
| 50th perc | 8.51 | 6.06 | 7.15 | 3.70 |
| 75th perc | 37.47 | 30.53 | 17.40 | 11.53 |
| Marketing ($m) |
| 25th perc | 5.41 | 0.68 | 0.76 | 0.15 |
| 50th perc | 25.23 | 3.80 | 4.11 | 0.61 |
| 75th perc | 117.94 | 22.4 | 13.16 | 3.00 |
| Adjusted EBIT ($m) |
| 25th perc | 31.23 | 11.57 | -41.76 | -17.49 |
| 50th perc | 88.57 | 40.72 | -13.21 | -6.38 |
| 75th perc | 375.97 | 151.56 | -4.50 | -2.17 |
| EV/Sales |
| 25th perc | 0.81x | 0.68x | 1.25x | 0.47x |
| 50th perc | 1.44x | 1.33x | 6.80x | 1.53x |
| 75th perc | 3.16x | 2.55x | 25.12x | 4.66x |

It is important to note that the reason it is observations and not companies is because companies can be unprofitable and become profitable over time or vice versa, so we are more so looking at observations of companies each year, treated as individual observations. There are only 1,880 observations of companies because being able to find actual EV/Sales for the company’s history, other pieces such as EBIT or marketing expense were entirely missing so the data was not used.

# Results

## Number of Profitable Observations Over Time

Before I began my analysis of valuation, I also wanted to address the number of profitable observations over time. In Table 4. Percentage of Observations Across Time below, it goes more in depth to see the change in each industry:

Table 4. Percentage of Observations Across Time

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cohort** | **Percentage of Profitable Observations based on Adjusted EBIT of all Pre-March 10th, 2000 Companies** | **Percentage of Profitable Observations based on Adjusted EBIT of all Post-March 10th, 2000 Companies** | **Percentage of Unprofitable Observations based on Adjusted EBIT of all Pre-March 10th, 2000 Companies** | **Percentage of Unprofitable Observations based on Adjusted EBIT of all Post-March 10th, 2000 Companies** | **Change in Profitable Observations Pre-to-Post** |
| Business Services | 65% | 76% | 35% | 24% | 12% |
| Consumer Cyclicals | 96.% | 91% | 4% | 9% | -6% |
| Consumer Non-Cyclicals | 98.% | 93% | 2% | 7% | -5% |
| Consumer Services | 92% | 89% | 8% | 11% | -3% |
| Energy | 100% | 93% | 0% | 7% | -7% |
| Finance | 62% | 75% | 38% | 25% | 14% |
| Healthcare | 78% | 77% | 22% | 23% | -1% |
| Industrials | 95% | 87% | 5% | 13% | -8% |
| Non-Corporate |  | 100% |  | 0% |  |
| Non-Energy Materials | 97% | 89% | 3% | 11% | -7% |
| Other |  | 100% |  | 0% |  |
| Technology | 88% | 85% | 12% | 15% | -3% |
| Telecommunications | 53% | 74% | 47% | 26% | 21% |
| Utilities |  | 91% |  | 9% |  |
| All firms | 87% | 84% | 13% | 16% | -3% |

In general, the observations tend to show a decrease across most industries in the proportion of profitable companies from Pre-to-Post. Industries like Utilities, Other, and Non-Corporate don’t provide meaningful data since they often represent one or two companies for which data was found. However, Business Services, Finance, and Telecoms did see the number of profitable companies increase between the two periods, which provides an interesting scope into how established but still relevant industries have seen an increase in profitable observations over time. Ultimately, more unprofitable companies in the Post period shows perhaps that it is easier to get funding to maintain a longer lifespan to achieve profitability in the Post-boom period as a company in many industries or that perhaps business savvy is higher and what is keeping more observations for unprofitable companies across a number of industries.

## Valuation Comparison (Mean and Median EV/Sales)

In Table 5 I present median EV/Sales for each profitability cohort. The mean EV/Sales is a poor measure of centrality for this analysis because if its potential to be inflated by companies with low current sales. More often than not, unprofitable companies in the past tended to have significantly higher valuations growth industries such as Healthcare, Tech, and Telecom. This is also the case in more established, long-term industries such as Finance, Business Services, and Industrials where the Pre-boom companies had significantly more bullish valuations. This is interesting because perhaps leading into the tech boom, in general, a majority of industries had more bullish valuations. It is also generally the case for the profitable companies before and after the boom, it follows a similar pattern where valuations were higher in the pre-boom era.

Focusing on technology industry more specifically, the industry saw a decrease in valuation multiple by 84.1%, whereas across all the industries, an average decrease of 34.6% was seen for all unprofitable companies across the pre and post-tech boom era. Tech multiples decreased far more for unprofitable companies than was the case in the economy as a whole based on our sample of observations.

One potential source of estimation error is how perhaps the many recessions in the post-period may have affected these valuation multiples: the Dot Com Burst in 2000, the recessionary period following 9/11, the Great Recession from 2008-2010 whose effects lingered for quite some time, and most recently the COVID-19 crash in March of 2020. These may have, to some level, have artificially decreased the valuations. However, given the dominance of tech companies across this era as well, there should be some hope that the strength of the tech industry as a a whole counteracted this in the median calculation.

Table 5. Percent Change in Multiples for Profitable and Unprofitable Companies Across Time

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Median EV/Sales for Profitable Companies Based on Adjusted EBIT (Pre-March 10th, 2000)** | **Median EV/Sales for Profitable Companies Based on Adjusted EBIT (Post-March 10th, 2000)** | **Median EV/Sales for Unprofitable Companies Based on Adjusted EBIT (Pre-March 10th, 2000)** | **Median EV/Sales for Unprofitable Companies Based on Adjusted EBIT (Post-March 10th, 2000)** | **Percent Change in Multiples for Profitable Companies (Pre-to-Post)** | **Percent Change in Multiples for Unprofitable Companies (Pre-to-Post)** |
| **Business Services** | 3.14x | 1.35x | 2.89x | 0.85x | -57.04% | -70.58% |
| **Consumer Cyclicals** | 0.86x | 0.72x | 0.47x | 0.54x | -16.73% | 14.10% |
| **Consumer Non-Cyclicals** | 1.05x | 0.94x | 0.39x | 0.39x | -10.47% | 0.41% |
| **Consumer Services** | 1.33x | 1.52x | 8.31x | 2.77x | 14.04% | -66.70% |
| **Finance** | 2.96x | 1.88x | 4.12x | 1.21x | -36.42% | -70.60% |
| **Healthcare** | 2.38x | 2.07x | 14.81x | 4.20x | -12.81% | -71.63% |
| **Industrials** | 1.01x | 1.06x | 2.02x | 1.22x | 4.39% | -39.62% |
| **Non-Energy Materials** | 1.28x | 1.10x | 0.86x | 1.97x | -13.74% | 127.63% |
| **Technology** | 2.74x | 1.71x | 8.49x | 1.26x | -37.57% | -85.13% |
| **Telecom** | 3.15x | 1.70x | 7.64x | 1.25x | -46.06% | -83.61% |
| **Average** | 3.14x | 1.35x | 2.89x | 0.85x | -21.24% | -34.57% |

# Conclusion

Ultimately, the results show that across the majority of industries, unprofitability was treated with a higher valuation in the period leading up to the March 2000 peak, rather than afterwards. Thus, perhaps it is not the case that we treat current tech companies with overvaluations and that this was a tendency even in the past with significantly higher valuations. Another possible conclusion is that companies like Tesla and Uber that may have significant overvaluation due to their relative sales may just make tech seem riskier due to the availability heuristic and in reality, tech has become a more stable and well-understood industry than it was before. In addition, the unique adjusted-EBIT used as a profitability measurement metric may have pushed many previously unprofitable companies over the line and due to their significant R&D or Marketing expense, they were valued lower, even though their growth prospects are very high. In general, it seems valuation has fallen off across numerous industries as show in the table below:

In a future analysis, I would want to screen for even more companies in particular industries and see if the results come out more meaningfully and search across more industries with different multiples besides EV/Sales, but overall, the data shows that unprofitable tech companies (an in general profitable and unprofitable companies across all industries) were valued higher in the past than they are now.

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwi284i07NP0AhVXCs0KHYi3CiAQFnoECBAQAQ&url=https%3A%2F%2Fpeople.stern.nyu.edu%2Fadamodar%2Fpdfiles%2Fpapers%2FR%26D.pdf&usg=AOvVaw2dPUhVRONNbRS7vtB74NPV [↑](#footnote-ref-1)