THE PRICING OF SUCCESSFUL VENTURE CAPITAL BACKED HIGH TECH AND LIFE SCIENCES COMPANIES

HOULIHAN VALUATION ADVISORS/
VENTUREONE STUDY
San Francisco, California

INTRODUCTION

Purpose and Scope of the Study

This article is the product of eighteen months of analysis and research conducted through the joint efforts of Houlihan Valuation Advisors (HVA) and VentureOne undertaken to examine the question: *What drives the pricing of venture capital (VC) investments in high technology and life sciences companies?* In particular, we have attempted to explain changes in the value of venture capital-backed high technology and life sciences companies between the initial equity financing round (typically at inception date), interim financing rounds, and their initial public offering. The San Francisco-based investment research firm VentureOne has made available its proprietary database of venture capital investments in high tech and life sciences companies. HVA, a national securities valuation firm, has used this reliable source of information to examine venture investors' activity and identify key factors involved in the pricing of venture capital investments in these companies.

This study examines the private financings of companies that have successfully completed their initial public offering (IPO) of common stock in the period of January 1993 through June 20, 1997. Given the rapidly increasing number of companies operating in these technology sectors, and the growing venture capital activity, HVA and VentureOne identified the need for developing alternative valuation methodologies to determine market pricing for pension funds (and other non-VC institutional investors), private and corporate investors, joint venturers, "investment angels", and entrepreneurs. As a result of this analysis, we have developed a methodology that is useful for the valuation of companies in emerging technologies and industries and for the pricing of their securities (i.e., equity and stock options). The characteristics below summarize the profile of the companies included in this study.

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655 Avenue of the Americas, New York, NY 10010

- The companies completed an IPO on a US stock exchange in the period of January 1993 through June 20, 1997, and therefore represent only the "winners" that achieved enough "success" to go public.
- Their shareholders are professional institutional venture capital partnerships investing primarily in the US; and they hold equity, rather than debt, in the company prior to IPO.
- The companies produce and develop products (high tech and life sciences) rather than provide services.

Methodology

To present our findings in the clearest manner, the methodology chosen segments our analysis into subject categories called dimensions. The main dimensions of this analysis are defined as follows:

1. *Stage of Development*: describes where the company is in its business evolution (Startup, Product Development, Product Shipping and Profitability).
2. *Type of Financing Round*: identifies six different round types that follow chronological order (Seed, First, Second, Third, Mezzanine and IPO).
3. *Industry Type*: six industries are grouped into high tech (Electronics, Semiconductors, Software and Communications) and life sciences (Biotechnology, and Medical Devices).

Stage of Development

The different development stages identify where the company is in the evolution of becoming a viable business. *Startup* represents the earliest stage when the entrepreneur has the concept or idea and has a team of people willing to work on it with the goal of developing a marketable product. *Product Development* follows the startup phase: the company is developing products but has not yet begun to ship or test them with customers. At *Product Shipping*, the company is shipping at least one product for which it is receiving revenues, regardless of the number of other products still in development or testing. The *Profitability* stage assumes that the company is shipping products from which it derives revenues and is profitable at least on an operating basis. These categories and their descriptions are consistent with VentureOne's proprietary database classification of development stages. In addition, the database includes one other stage: *Product in Beta Test/Clinical Trials*. Beta Testing is the intermediate stage between Development and Shipping and constitutes a rather brief interval prior to product rollout, especially for high tech firms. Although our analysis incorporates this stage, we will not include it in this article since the number of observations is very low compared to that of the four main stages of development.

Type of Financing Round

With regard to financing rounds, *seed* is the initial equity funding by a venture capital investor. For the round to be defined as *seed*, the amount raised cannot exceed $2 million, the company has to have been in business for less than two years (it cannot be significantly into product development or shipping), and the development stage must be startup. Otherwise it is considered a *first* round. Because not all companies' initial financing meets these requirements, *first* round includes some startups. *First*, *second* and *third* rounds follow chronological order, and legal documents may refer to the securities issued as Series A Preferred Stock, Series B

Preferred Stock, etc[1]. A *mezzanine* round is usually the last venture round prior to a public offering and must close within 12 to 24 months prior to an IPO. The *IPO* round is an equity financing event whereby the company raises capital in the *public* equity markets for the first time. In addition to these six rounds, VentureOne tracks other types of financing rounds such as later[2], Regulation D, Restart, and Leveraged Buyout. These additional rounds have also been included in our analysis but are not presented separately in this article due to the limited number of observations[3].

Industry Type

The industry name categorizes the company based on its major product during the financing round. For example, the software industry is comprised of companies for which software development is the core business, regardless of any other activities in which they may be engaged. In addition, we have grouped industries according to the nature of their primary business resulting in aggregate groups called *high tech* (software, communications, electronics and semiconductors) and *life sciences* (biotechnology and medical devices) companies.

Multidimensional Analysis

With this understanding of the core dimensions, it is now easier to visualize the multi-dimensional picture depicted by the analysis. Formatting the data through a dimensional approach permitted measurement of both aggregate and detailed information regarding any combination of categories. For example, we can select information about all life sciences companies in development stage (aggregate data), or we may want to look at only biotech companies in shipping stage at mezzanine round (crisp detail). The information viewable through this dimensional window can be any of the following: returns on equity, increases in equity value between rounds or development stages (step-ups), invested capital per round (amount raised), price-to-trailing revenues multiples, performance of a particular venture capital firm, or measurement of law firms and underwriters by the success of their venture clients at IPO and the like. The underlying purpose of the analysis will dictate the variables that should be considered and evaluated. Our goal is to understand how venture capitalists, in conjunction with entrepreneurs, analyze circumstances to agree upon the price of a company at a particular financing round, in a certain industry, at a specific stage of development, at certain market intervals. The dimensional view was integral to the analysis employed in this study.

Key Definitions

The terms used throughout the discussion of the study's results are defined as follows:

- ***Pre-Money Valuation***: post-money valuation of a company at a financing round minus the amount raised at that round. For example, a post-money valuation of $10 million after raising $3 million implies a pre-money valuation of $7 million.
- ***Step-Up in Value***: increase in a company's pre-money valuation between two financing rounds. It is calculated as the pre-money valuation at a round divided by the pre-money valuation at a prior round. For example, a company with a pre-money valuation of $2 million at the first round and $10 million at the second round has realized a step-up in value of five times between these two financing rounds.
- ***Return on Capitalization (ROC)***: annualized change, or growth, in pre-money market capitalization between two rounds. To some extent, it would represent the annualized returns on equity for an investor at a certain financing round, without considering the potential dilution effects caused by the entrance of new investors at subsequent rounds.

Structure of the Study

The data was analyzed in two distinct but complementary ways: a transactional data analysis and a statistical analysis. First, the transactional approach measures the following key variables: time between financing rounds, time until IPO, amount raised at each round, pre-money valuations, price-to-trailing revenues multiples, step-ups in value between any round and the IPO, step-ups in value between any two rounds or development stages, and returns on capitalization. This kind of analysis provides insights about the determining factors of venture investing in the high tech and life sciences industries. Accordingly, we have segregated different companies' profiles and the specific investor returns, valuations and multiples assigned, or attributed, to them – and their respective industries. It also yields general information regarding trends in the financing of these companies over the past four and one-half years. In short, the transactional analysis provides information pertaining to over 1,700 financings (private investments and IPOs) and the known variables most relevant to their pricing.

The second approach, statistical analysis, is a key element in any study that deals with such a large volume of data. Its intention is not only to test the accuracy and validity of the results and conclusions reached at the transactional level, but also to go beyond this first layer and add another valuable dimension to the study. With this type of analysis one can measure the explanatory power of several variables with regard to pricing. In this study, we tested the variables that may explain why the value of a company increases, or decreases, over time, between rounds or development stages. We observed how these variables were prioritized, identified their weighting in the determination of pricing, and analyzed how those weights change over time. The statistical analysis helps one to understand how variables interact with one another. To conduct the analysis we engaged two experienced statisticians – not to build a model that forecasts or estimates values, but to group and interpret facts and identify trends or commonalties observed in the data.

Our analysis proceeds in the following order. First, we performed an analysis of the transactions at a macro level, comparing high tech and life sciences companies, in the aggregate,

as two distinct groups in order to observe the differences and commonalities between them. Then, we examined the industries of each group separately to observe their performance. Lastly, we conducted the statistical analysis. The analyses were done by year of IPO (each industry analyzed by each year) as well as in the aggregate (each industry taken in all years together). Because we believe this process to be the most effective way to analyze this volume and variety of data, the sequence of this paper's presentation will follow the same format. We begin with some of the general findings at the transactional level.

Description of the Data

The analysis covers transactional data from 479 companies. All the companies had at least one venture financing - typically seed or first financing round, depending on the amount raised, development stage and company age at the round (see "Methodology" section for a complete description of financing rounds). Occasionally a company may have had only a mezzanine round and no prior financings. Not all companies completed a seed or a mezzanine round, although most had first and second rounds. The median number of financings per company is approximately three, and the company with the most venture financings raised funds on twelve occasions. *A breakdown of the data by industry, financing round and development stage for the years 1993 through 1997, including the 479 IPOs, follows below.*

	Financing Round						***Development Stage***			
Industry	***Seed***	***1st***	***2nd***	***3rd***	***Mezz***	***IPO***	***Startup***	***Develop***	***Shipping***	***Profit***
Electronics	10	37	32	23	10	54	17	29	70	50
Semiconductors	11	37	38	26	19	50	19	39	65	58
Software	23	102	79	49	40	134	34	53	195	145
Communications	17	66	53	32	32	78	28	55	125	70
Biotech	43	89	71	53	42	96	59	271	53	11
Medical Devices	24	63	55	40	31	67	34	133	94	19
Total Transactions	**128**	**394**	**328**	**223**	**174**	**479**	**191**	**580**	**602**	**353**

Note: There are as many companies as IPO rounds (one IPO per company). The number of transactions by development stage includes all six financing rounds, from seed to IPO.

As the chart above depicts, most companies received financing during the product shipping (602 transactions) and product development stages (580 transactions)[4]. Unlike companies that went public in the period 1993-95 that were funded primarily at product development stage, the IPO years of 1996 and the first half of 1997 were characterized by companies which completed most financings (including the IPO round) at product shipping stage. In order to identify changes in pricing trends, we examined the data according to the year in which the companies completed an IPO. Of the 479 companies analyzed, 98 had an IPO in 1993, 65 in 1994, 139 in 1995, 143 in 1996, and 34 through June 20, 1997. The data can also be analyzed according to the year in which venture financings occurred, regardless of what year the companies went public. The companies that are the subject of this study had venture financings over a wide period of time (starting in 1973), with most of them clustering in the early to mid 90's. *Transactional data (including IPOs)for the 479 companies by industry and year of financing is summarized in the following chart.*

Industry	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997**	*Total Transactions*
Electronics	13	10	11	9	24	12	30	8	1	118
Semiconductors	14	11	10	13	30	20	23	6	7	134
Software	17	23	28	39	44	53	88	68	11	371
Communications	17	28	29	25	45	38	37	25	5	249
Biotech	24	26	33	53	66	39	48	52	11	253
Medical Devices	17	14	21	28	42	31	45	42	3	243
Total Transactions	**102**	**112**	**132**	**167**	**251**	**193**	**271**	**201**	**38**	**1467**

* January 1 through June 20, 1997.

Software and biotech companies registered the greatest number of financings, while electronics and semiconductors companies received the least. The year showing the most venture financings is 1995, with 271 transactions, some of which went to companies that went public during 1996 and the first half of 1997. Note that the financings above refer only to the 479 companies comprising the study and which successfully completed an IPO between January 1993 and June 1997. Companies that completed an IPO in the near past show a decreasing number of venture capital financings compared to those companies that went public in 1993, 1994, and even 1995[5]. An enthusiastic public equity market eager for technology stocks, making the public equity market accessible earlier, has contributed to the decline in venture financings observed since 1995.

TRANSACTIONAL ANALYSIS

General Findings

Data from the companies and their venture financings was imported from VentureOne's database to an Excel spreadsheet. By using pivot tables, key fields and variables were defined, combined and analyzed. For example, pivot tables enabled us to examine variables such as the step-up in value experienced by software companies from the seed financing round to the IPO round, or the price-to-trailing revenues multiple and median pre-money valuation derived from financings of communications companies in the product shipping stage. Observations of this type were made as well for the aggregate group of high tech and life sciences companies. A summary of key findings is presented below.

- ***Life sciences companies are faster to IPO than high tech companies.***

The time between each financing round and the IPO, for companies analyzed in this study, was greater for high tech than for life sciences companies. Setting aside semiconductor and electronics companies, however, the results are more even (although in general, life sciences firms are still slightly faster in reaching the IPO).

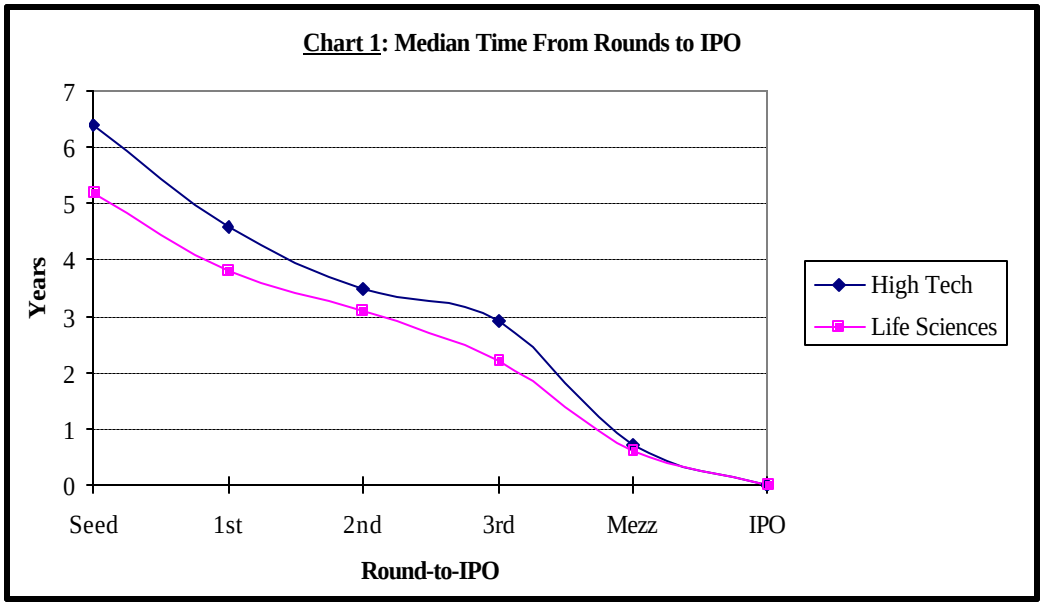


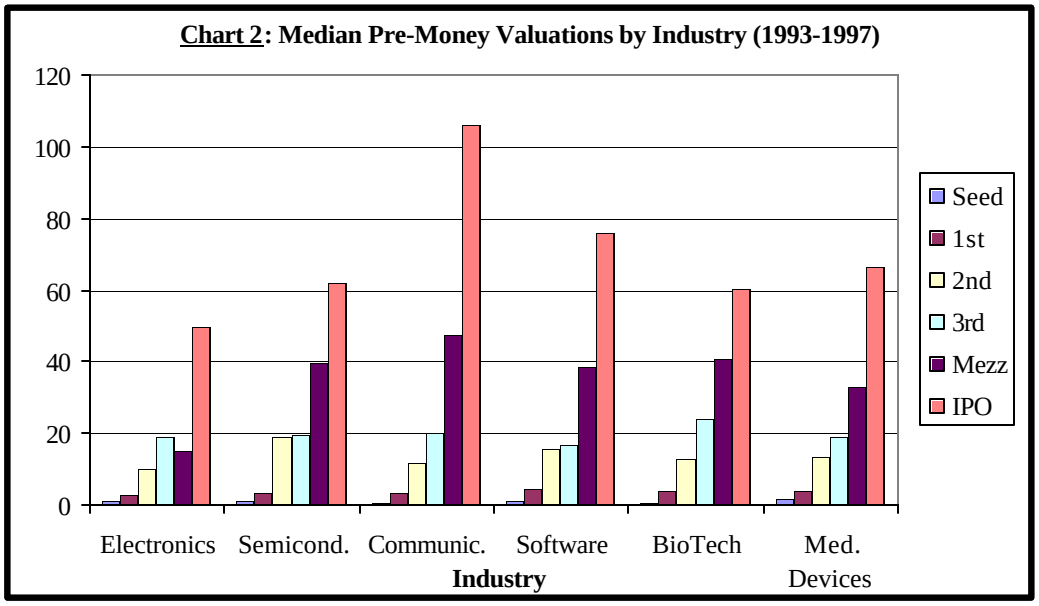
Chart 1 demonstrates this relationship by illustrating the timeline to IPO for high tech and life sciences companies.

The gap between the curves can be explained by the fact that life sciences companies require higher funding levels than high tech firms due to a longer product development period. Life sciences companies can afford to go public at earlier stages of development (i.e., product development) than high tech companies, and they raise the larger amounts of capital required to fully develop a product or technology and start generating revenues.

Timing affects other variables, as well. The time from financing rounds to IPO shows differences among years, especially when we consider 1996, a year in which many companies rallied to go public, taking advantage of a "wider IPO market window" (an accommodating market with a broad appetite). The period of time between each round and an IPO in 1996 compressed significantly at all rounds. The drop was steeper in high tech than life sciences companies – due in large part to the IPO rush in communications and software industries, and even electronics firms.

- ***High tech and life sciences companies show similar pre-money valuations for earlier rounds, but valuations vary widely in later stages.***

Communications companies received the highest pre-money valuations of all six industries at the mezzanine and IPO rounds.



Observing pre-money valuations on a yearly basis, high tech companies' valuations have been higher than in prior years for seed to mezzanine rounds and at IPO since early 1996. High tech companies that went public in 1996 and during the first half of 1997 had higher pre-money valuations at earlier rounds than companies that went public in any other year. One of the reasons for these higher valuations could be the increasing amount of institutional money going into venture funds. Another reason could be that the favorable IPO market since 1995 may have influenced the pricing of venture investments thereafter, driving private financings in 1996 and 1997 to higher levels than in previous years.

The life sciences group, however, showed radically different results: declining valuations in 1996 and during the first half of 1997 (except at IPO) from peaks in 1995. Biotech investors may have uncovered a new rationale for pricing these types of companies during this period. Many in the industry have speculated that in the height of the biotech craze of the early 1990s, analysts used inappropriately low discount rates on projected cash flows and underestimated the lengthy FDA approval process. Realization of these discontinuities may have impacted the private equity markets for biotech in the 1995 time frame, and this newfound rationale may explain, in part, our observation.

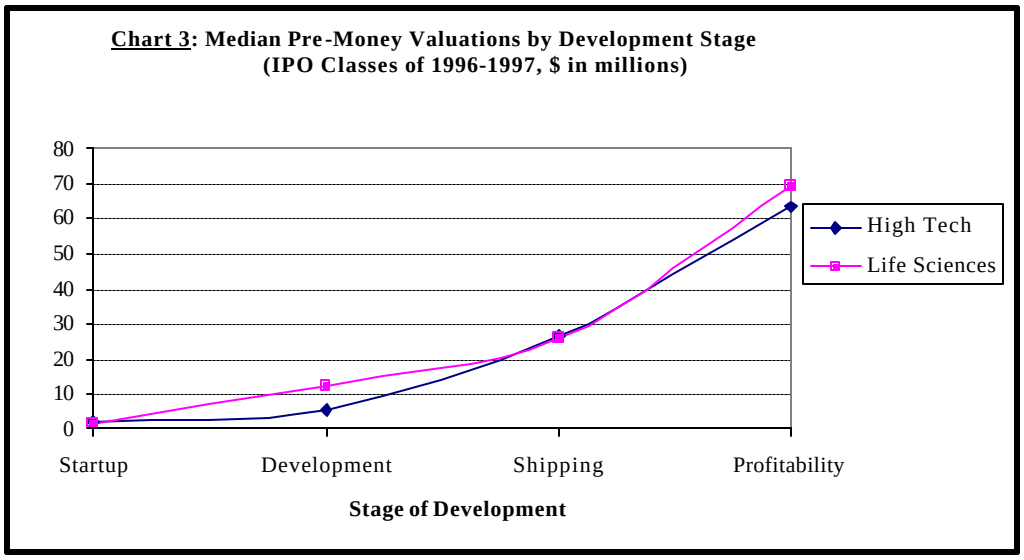
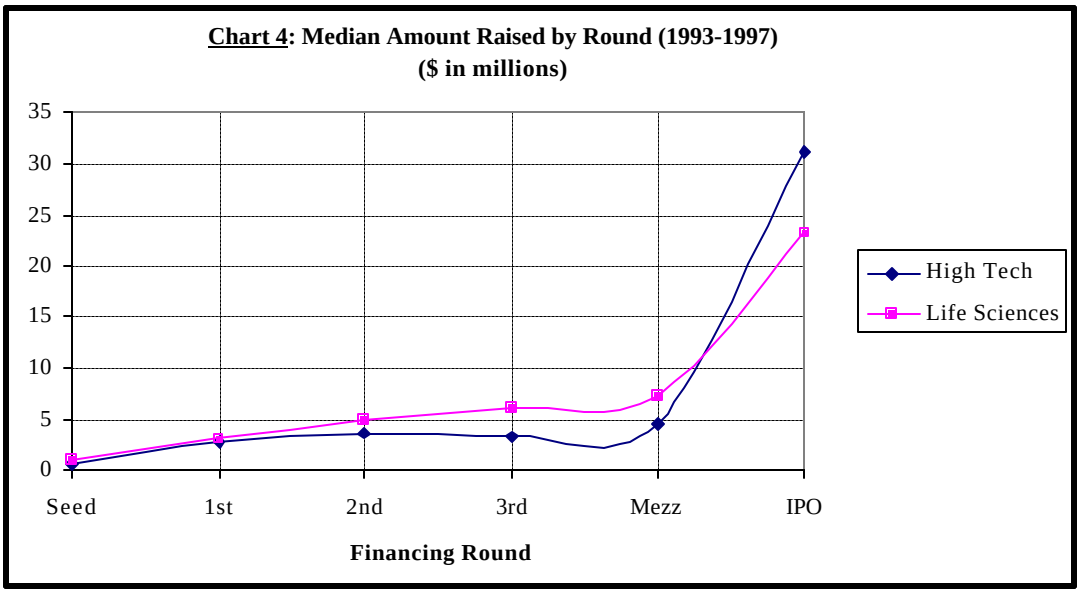


Chart 3 illustrates that both groups show logical increasing pre-money valuations from startup to profitability stage. The most significant difference in value between life sciences and high tech firms occurs at product development stage. The spread narrows as companies progress to product shipping, and it widens again as they approach profitability.

The companies that went public in 1996 and during the first half of 1997 are peculiar in that the value spread between the two groups narrows compared to previous years. High tech companies seem to get lower valuations than do life sciences companies at product development and profitability stages.

- ***High tech companies tend to raise less capital than life sciences companies at all financing rounds except IPO, due in part to a shorter time to IPO (see Chart 1) and favorable market appetite for their stock during all years of the study.***

Life sciences firms are observed to raise *greater* sums than high tech companies from seed to mezzanine rounds; the closer to IPO, the higher the amounts raised. High tech firms, on the other hand, raise more funds from seed to second rounds, drop slightly at third and increase thereafter, reaching the highest level at IPO. *Chart 4* illustrates these differences between the two industry groups.

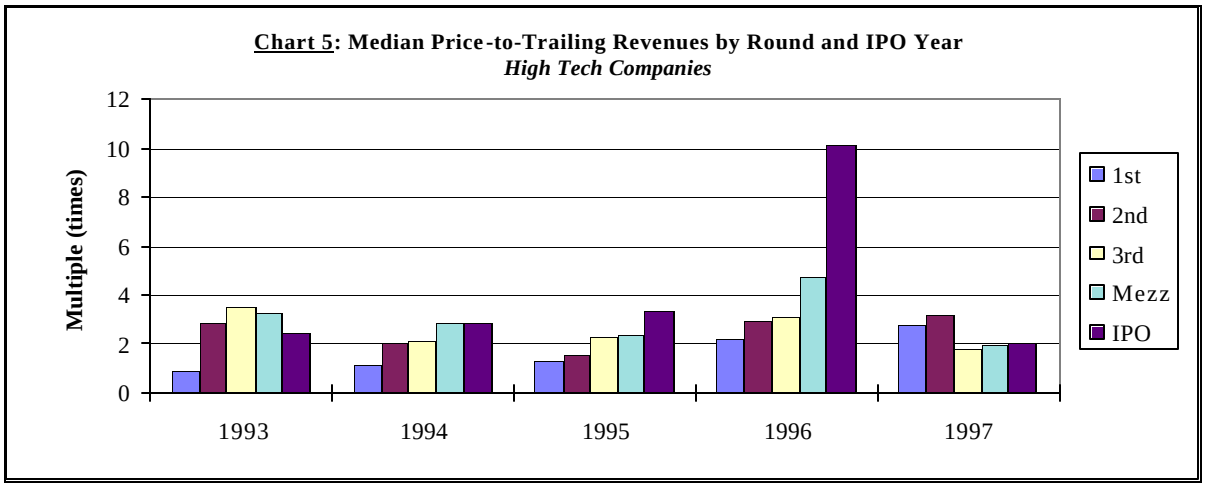


Although not depicted in the chart above, we observed that the closer a company is to the profitable stage of development, the higher the amount of capital raised. Life sciences companies tend to raise more money than do high tech firms at product development and shipping stages. This reflects the fact that life sciences companies spend a greater amount of time in the product development stage than do high tech companies. High tech companies, however, attract more capital at startup and profit stages. Communications companies are the leaders in fundraising, followed by biotech companies.

Finally, the amounts raised per round and development stage demonstrate important differences among the years analyzed. Amounts raised by companies that went public in 1996 and during the first half of 1997 have soared at all rounds, particularly mezzanine and IPO.

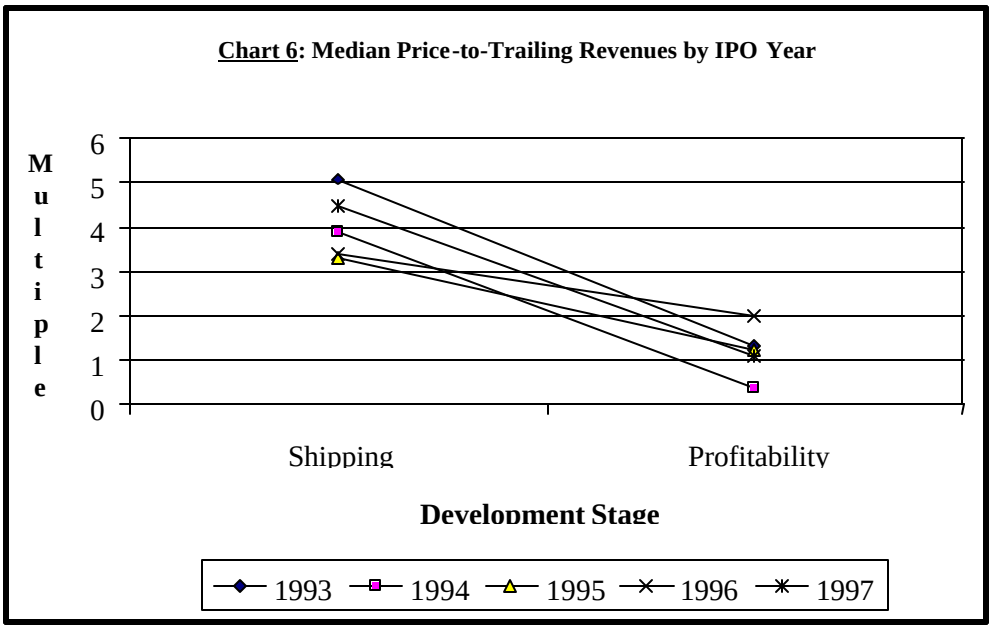
- ***On average, both high tech and life sciences companies went public at higher price-to-trailing revenues multiples in 1996 than in any other year.***

Price-to-trailing revenues multiples are much higher for the life sciences group than for high tech firms because most of the former either have lower revenues than high tech or they begin to generate revenues only near the time of their IPO. While most high tech companies primarily seek private funding to finance their growth, life sciences companies tend to utilize IPO proceeds to fund their research and development efforts. As the *Description of the Data* section of this report shows, the majority of high tech companies completed an IPO during the Product Shipping stage, that is, they had already started to generate product revenues. Conversely, most life sciences companies went public during the Product Development stage, characterized by heavy R&D expenditures and a lack of revenues[6].

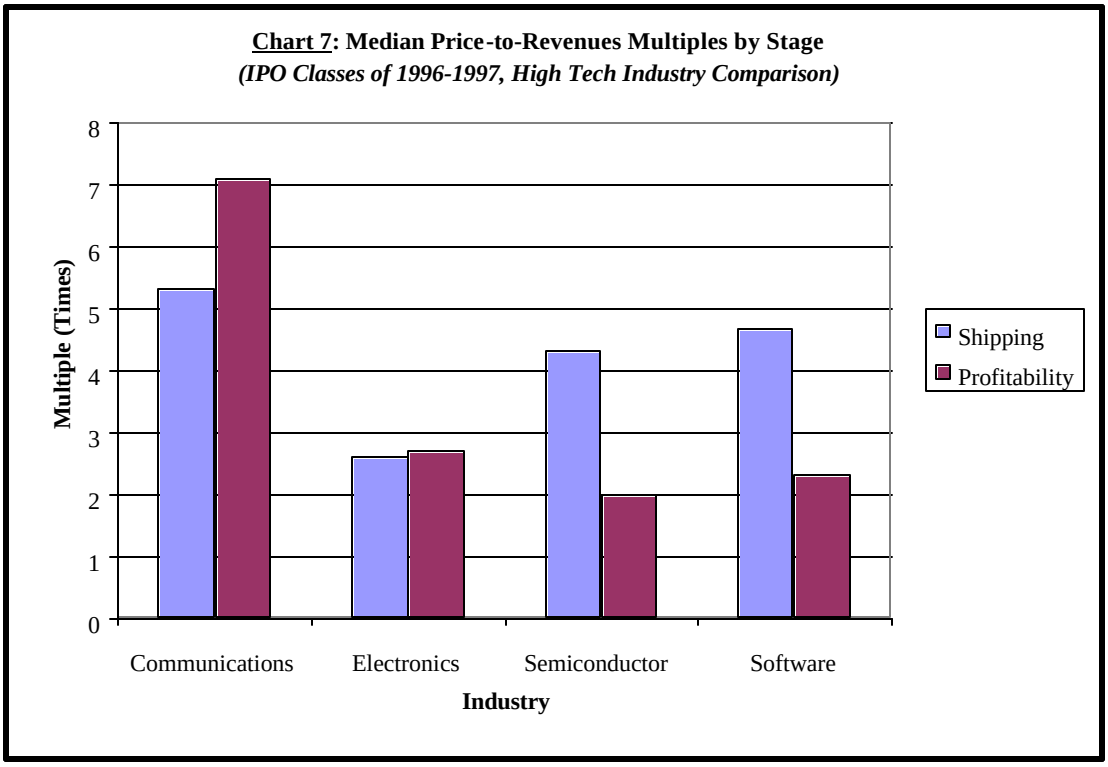


The highest price-to-trailing revenues multiples of high tech firms are not always observed at the IPO round; this is true in 1995 and 1996 only, as *Chart 5* depicts. The life sciences group shows very similar relationships between rounds, with multiples at IPO typically higher than those at earlier financing rounds. High tech companies that went public in 1996 show the highest multiples, even at pre-IPO financing rounds. This observation indicates that companies priced at high multiples by venture capitalists went public at above-average multiples. The poor IPO aftermarket performance of many of these stocks suggests that (private and public equity) investors overpaid for these companies (see *Initial Public Offerings Often Not Letter-Perfect*, Chicago Tribune, July 27, 1997, and *Marketwise Perspectives*, News.com, February 20, 1997).

There are major differences in the price-to-trailing revenues multiples at the product shipping and profitability stages (see *Chart 6*). The companies that went public in 1994 registered lower multiples at both stages of development compared to the IPOs of 1993. The companies that completed an IPO in 1996 exhibited the highest multiples of the period analyzed at profitability stage, while those that went public in 1993 showed top multiples at shipping stage.



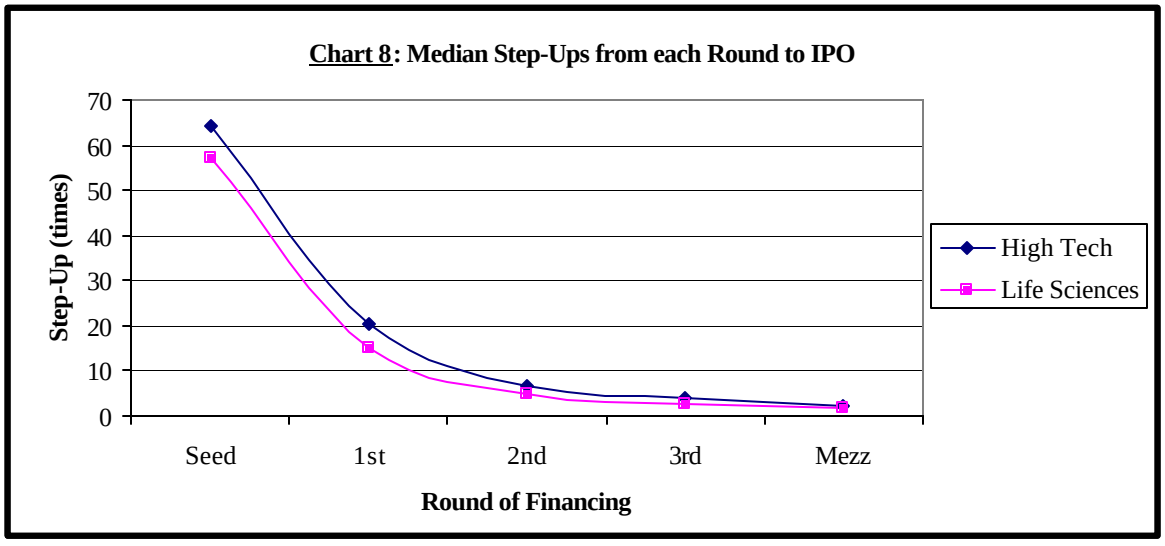
We also observed disparities among industries with regard to price-to-trailing revenues multiples. *Chart 7* shows the relationship for the 1996-97 data.



From a price-to-trailing revenues approach, communications and electronics experience an increase in multiples as companies move from product shipping to profitability. The comparison between software and semiconductor companies shows a surprising similarity: they are priced at almost identical multiples declining from product shipping to profitability stage. Similarly, the two life sciences industries show declining price-to-trailing multiples from product shipping to profitability stage, and close to those of semiconductor and software companies.

- ***High tech companies achieve higher step-ups in value than life sciences companies, especially from seed and first financing rounds to IPO.***

Step-ups are increases in company valuations from one point in time to another. VentureOne tracks a company's pricing each time it has a financing round[7]. Therefore, we have a valuation point for each time (round) that a company obtains financing and observed that high tech firms typically have higher step-ups between rounds and development stages than that of life sciences companies. This result is attributed to the outstanding performance of two components of the high tech group: software and communications companies. *Chart 8* depicts these relationships:

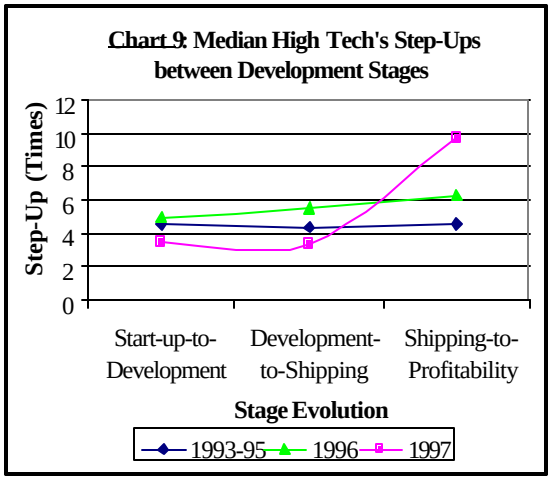


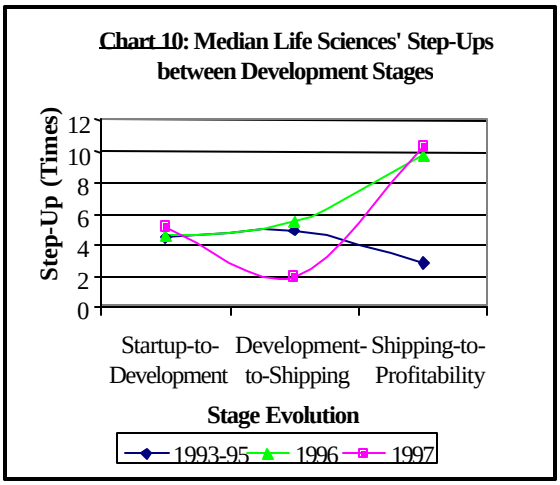
Mezzanine investors obtain higher returns than investors in prior rounds because of the very short time between the mezzanine round and the IPO, and not as a result of a large step-up in market value, which would benefit prior rounds investors as well[8]. In fact, the closer a financing round is to the public offering, the smaller the step-up in value to the IPO.

- ***Step-ups between consecutive financing rounds or development stages vary significantly.***

In the high tech group, the *lowest* step-up between two consecutive rounds typically occurred between the second and third financing rounds. This means that the value of an investment made at a second round for a high tech company does not increase significantly (relative to changes between other rounds) at the time of the third round. This is common to all years observed. The life sciences group shows very similar results although the lowest value creation occasionally takes place between the third and mezzanine rounds.

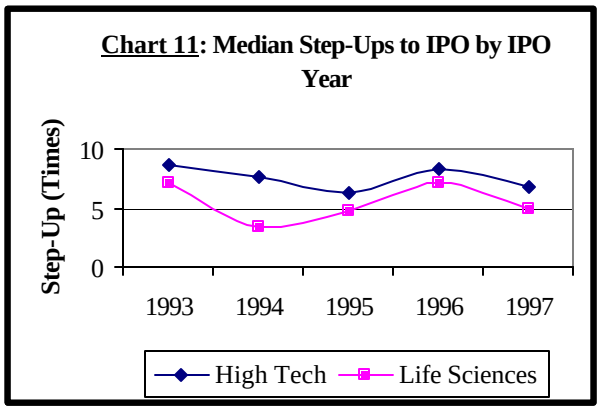
Regarding step-ups between development stages, both categories of industries display steady or flat step-up multiples between startup and product shipping (approximately 4x to 5x, except high tech in 1997), as *Charts 9* and *10* illustrate. Nevertheless, as companies turn to profitability stage, step-up multiples tend to increase.

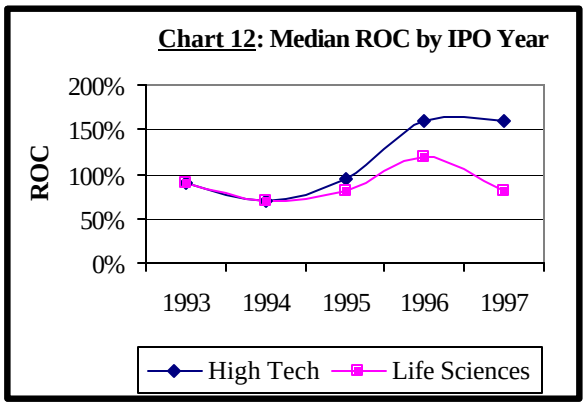




As shown in the statistical analysis section of this report, the shorter the period from inception to a given round, the higher the step-up in value to IPO. In addition, earlier stage, less profitable companies tended to reach higher pre-money valuations and step-ups in value the closer the financing occurred to 1996. The more quickly a company reaches milestones required for subsequent funding, the greater reason to reward the company with a greater step-up in value.

The explanation for the lower value step-ups in 1994 mirrors the *pre-money valuation* section of this paper. Just as the strong 1995 IPO market contributed to higher valuations in venture financings, so too did the favorable 1993 IPO market push up valuations of privately held firms. A "colder" 1994 IPO market drove venture valuations to only modest increases. Consequently, the step-ups in value – and returns on capitalization, or ROC – were generally lower in 1994 than in any other year. *Charts 11* and *12* illustrate the timing effect on step-ups and returns.





The highest pre-money valuations were registered by the "class" of 1996. Valuations in 1993 and 1995 were almost as high and slightly higher in the latter year, particularly at early financing rounds. This explains, in part, why step-ups to IPO were lower in 1995 than in 1993 (see *Chart 11*). The 1996 IPOs show the highest ROC, followed by the IPOs of the first half of 1997, particularly for high tech companies, as *Chart 12* displays.

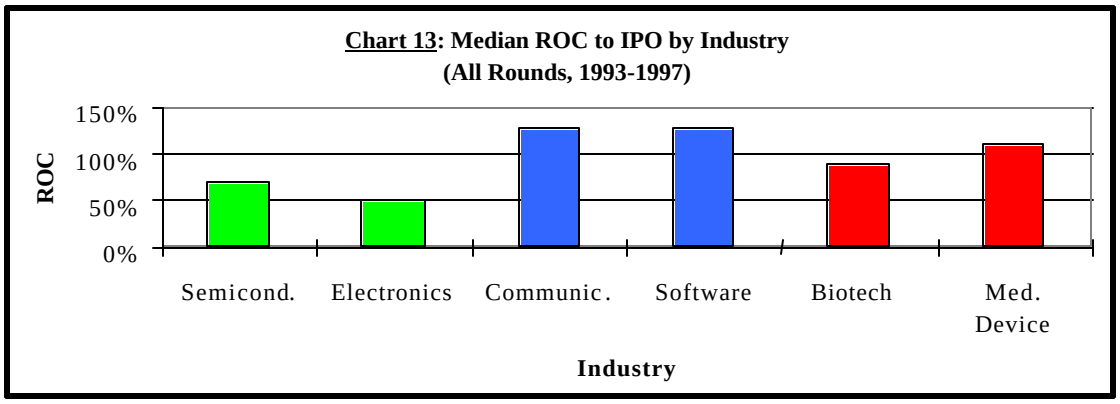
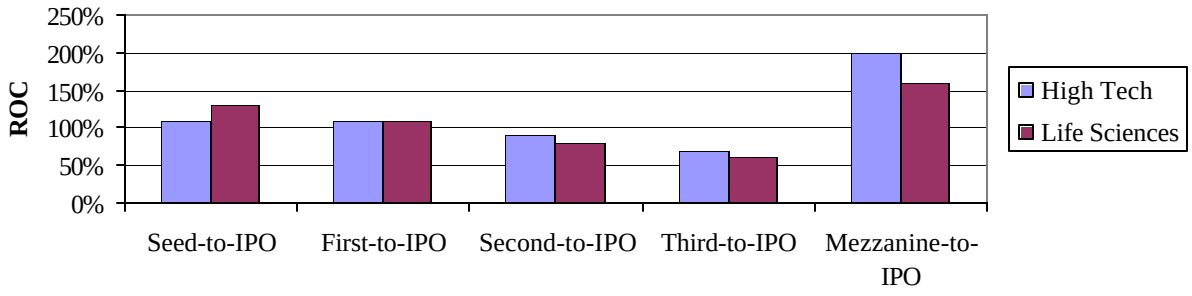


Chart 13 depicts the overall median ROC obtained at IPO by investors who invested in all financing rounds from seed to mezzanine (assuming equal amounts of funds were invested each time). For example, an investor who invested a fixed amount of dollars (e.g. $1 million) in each financing round of an average communications company would have reached a median ROC of 125% (on a total investment of $5 million, assuming there were five private financing rounds, and without considering the effects of dilution). The median ROC suggests that, regardless of the pre-money valuations, investors require different returns according to three risk classes represented by the following groups: electronics and semiconductors, software and communications, and biotech and medical devices.

- ***Both high tech and life sciences returns on capitalization to IPO decline in the progression from seed to third rounds and increase significantly at the mezzanine round.***

The data show that seed investors generally realize higher returns than first, second and third round investors. First round investors obtain better results than second and third round investors, and second round investors reach higher returns than third round investors. Mezzanine round investors reach the highest returns, regardless of IPO year or industry. *Chart 14* illustrates this trend:

Chart 14: Median Returns on Capitalization from each Financing Round to IPO



Comparing the two groups based on ROC to IPO, high tech has yielded higher results than life sciences, due mainly to the strong returns of software and communications companies. Further, we identified a shift from biotech to medical devices: while the former reached a higher ROC during 1993 and 1994, medical devices outperformed in 1995 and repeated higher results in the remaining two years, registering higher returns at every round.

Returns on capitalization measure the required rate-of-return that a venture investor would expect from an investment made in a company with a given risk level. The higher the risk, the greater the required return. Given this generally accepted tenant of finance, the combination of *Charts 13* and *14* indicates that venture investors perceive software and communications firms as a riskier investment than life sciences companies, which in turn are riskier than semiconductors and electronics companies.

Chart 14 shows how, as a company proceeds to the IPO, returns on capitalization decline at every round except mezzanine. The declining returns suggest that investors consider older, more experienced companies a safer investment.

- ***The market appetite for IPOs has a significant impact on pricing.***

Step-ups and returns on capitalization at IPO are largely affected by the market conditions under which a company goes public. High tech and life sciences companies show the highest returns and step-ups in 1996, and the lowest ones in 1994 (see *Charts 12* and *13*). It cannot be overstated that the IPO market at a specific point in time has a dramatic effect on valuation.

The favorable IPO market in 1996 not only increased step-ups in value but also reduced the time between financing rounds and the IPO, resulting in higher returns on capitalization. While step-ups to IPO generally dropped from 1996 to 1997 (see *Chart 11*), high tech returns remained at the same level due to a shorter time to IPO (see *Chart 12*). Life sciences' returns declined with step-ups since their time to IPO did not change significantly from prior years.

In terms of ROC, both high tech and life sciences show very similar profiles, moving together in the same direction. However, this observation does not necessarily mean that they yield analogous returns, as *Chart 12* illustrates. Since 1995, high tech companies have consistently yielded higher median returns than life sciences companies. Step-ups to IPO also show parallel trends for both industries, as *Chart 11* depicts. Generally, returns and step-ups tend to be higher for high tech companies than life sciences companies for the period analyzed.

As venture capitalists' estimates of the potential market for high tech companies' products increase, they are willing to pay more for these firms. Also, the high prices paid for startups may be a result of the increasing amounts of institutional money committed to venture funds. According to a recent study by Prof. Joshua Lerner and Paul Gompers, two Harvard Business School faculty members, venture capitalists historically have paid 10% to 25% more than they otherwise would for equity stakes in companies when institutional investors pour large sums of money into venture funds. These investments have had increasingly shorter payback periods (or less time to IPO) and higher IPO valuations, resulting in spectacular investor returns, especially between January 1995 and June 1997. A "colder" or less ebullient IPO market would reduce the market pricing for such stocks. Under this scenario, step-ups in value would decline significantly, resulting in a negative impact on investor returns.

STATISTICAL ANALYSIS

Objectives and Methodology

The above analyses examined relationships between two variables or dimensions, as well as trends within single variables. Additional multivariate analyses were undertaken to examine the relative importance of company characteristics in valuations and to describe significant differences between industries and valuation trends over time - that is, all variables were examined together to discern the significance of individual characteristics.

A general linear model employing ordinary least squares was used, regressing the valuation of companies on their characteristics. These independent variables included age at round, round type, year founded, stage of development, industry segment, geographic region, and time to

IPO. Revenues and number of employees (as proxy for firm size) were not used, as VentureOne has not historically archived this data.

Pre-money valuation and step-up in value were the dependent variables; their logarithms were regressed on dummy variables created from the categorical variables and on the logarithms of the continuous variables. This model was used to combine categorical and continuous variables, to control for multiplicative relationships (for example, larger / older / later stage companies can attract disproportionately larger valuations), and to control the impact of outliers.

Finding

- **Companies identified as being in a profitable stage had significantly higher valuations.**

Controlling for all other variables, these companies were more likely to have higher valuations than similar companies in either development or shipping mode.

- **East Coast/West Coast companies (particularly California) had significantly higher valuations.**

Controlling for all other variables, a company located in California or Massachusetts was more likely to have a higher valuation than a similar company in another state or region.

- **Communications companies had higher valuations than other companies in the universe studied, as well as significantly higher step-ups.**

Among companies with similar business stage status, location, and start date, communications and networking companies were more likely to have higher valuations than companies in other industries.

- **The type of financing round is the most significant factor in determining the value increase experienced by companies.**

Later rounds are associated with higher valuations, even when considering whether a company is in product development, product shipping or profitability stage. The round type is the variable most strongly associated with level of valuation. Generally, earlier rounds tend to have lower valuations than later rounds.

- **Step-ups in value decline from start-up to profitability stages, with the aging of a company and with increases in amount raised at any particular round.**

That is, start-up companies generally have higher step-ups than developmental stage companies, which in turn generally have higher step-ups than profitable companies. Likewise, younger companies have higher step-ups than older companies, and companies raising less money in a round have higher step-ups than their higher funded counterparts.

- **With all other variables considered, specific years were not significant in determining differences in step-ups.**

After examining round types, business stage, and industry types of companies, the year of IPO was not significant in predicting the valuations of companies. Again, the round type was most significant; and location, type of industry, and business stage of companies were also significant correlates of highly-valued companies.

APPLICABILITY OF THE STUDY

This study incorporates elements that are key in any security valuation. It examines institutional investors' risk-return profiles of private placements of equity over a four and a half year period for very young companies in emerging technologies and industries[9]. In addition, it provides indications regarding the importance and prioritized weights of several variables with regard to pricing. Moreover, it demonstrates valuable insights about the differences among distinct stages of development and types of financing rounds under alternative scenarios (which correspond to the cycles observed by IPO year).

HVA has applied certain findings of this analysis to valuations of technology companies, in conjunction with generally accepted valuation methodologies. The results are compelling. The methodology, which combines both the fundamental and statistical analysis, deploys a powerful tool for the valuation of technology companies (especially those in very early stages of development) and the pricing of their securities. The valuation of nascent technology firms does not respond to classic pricing methodologies or models. Technological advances are swift and the market's reaction to new products and services is somewhat unpredictable. The discounted cash flow (DCF) analysis may not deal effectively with factors that defy supportable modeling (such as selecting an appropriate discount rate). In these cases, a better indication of value comes from a market approach that is based on an analysis of truly comparable companies. The analytical method presented herein is such an approach, and the resulting valuation methodology conforms to observed and measured private pricing transactions.

An Example

Consider the utility of the study on the valuation of an Internet applications company in a very early stage of development about to negotiate a financing round with investors. The management requested that HVA perform an analysis and determine the investment value of the company. We conducted a thorough analysis of the industry, performed a due diligence of the company, and applied various valuation methodologies, including the method presented herein. This method allowed us to examine several variables – pre-money valuations, returns on

capitalization, value step-ups, amounts raised, and time to IPO, among others – with regard to the pricing of similar Internet applications companies with respect to age, development stage, and fundraising history. Further, it provided a range of values for three alternative scenarios (according to the then current "appetite" of the capital markets, a key element of the study). Finally, and in conjunction with the results derived from more conventional, widely accepted valuation methodologies (primarily discounted cash flow analysis and market approach), we determined a valuation range for the company.

Implications of the Study

This methodology adds much to the overall analysis, and to some extent it provides a superior and unique insight into valuing early stage technology and life sciences companies. For instance, it did not require subjective assumptions about a key factor in determining a private company's value: the lack of marketability adjustment, which reduces the value of a marketable security due to the illiquidity of the private firm's stock (since it is not publicly traded). Because the data used in our analysis corresponds to companies that were private during all of their financing rounds, the pre-money valuations implicitly consider the illiquidity factor[10]. Therefore, no subjective assumptions regarding a marketability discount or further adjustment for illiquidity was needed. Furthermore, based on the pre-money valuations of these firms, we calculate the illiquidity discounts applied by venture investors to these types of companies at each development stage.

The data and findings presented in this paper demonstrate the important factors necessary for equity allocation and the pricing of a broad variety of assets such as incentive stock options (ISO's) and technology (in the form of allocation of value to technology, products or patents). Finally, this analytical method is useful not only for private, corporate and institutional investors, but also for entrepreneurs who require a valuation tool for analyzing their business from inception to IPO.

This study and its findings are the product of the collaborative efforts of the following individuals: John Draper; Luis Gutierrez-Roy; Steve Kam; Alice Prager; Greg Robin; Russell Snipes; Dave Witherow; and Jean Yaremchuk. For information on products and services offered in conjunction with this study, contact Steve Kam of Houlihan Valuation Advisors at 415-392-0888 or at kam@houlihan.com, or Jean Yaremchuk of VentureOne at 415-357-2100.

Endnotes

[1] VentureOne's database does not differentiate between common and preferred stock, and therefore, neither does this study.

[2] *Later* rounds generally include fourth, fifth and subsequent rounds of financing. The round may also be called later when the company has been in business for a few years, is not considered a startup, previous financings are uncertain, and there is no other round categorization that fits.

[3] For inquires regarding development stages (i.e., beta testing/human clinical trial) or financing rounds (i.e., later rounds, leveraged buyouts, restarts and Regulation D) not presented herein, please refer to the end of the article for contact information.

[4] Additional data regarding yearly combinations of financings and development stages is available upon request.

[5] For further information with regard to venture financings that occurred after June 1996, and transactions involving venture capital backed companies that went public before 1993 or have not yet completed an IPO, contact VentureOne.

[6] Of the 34 companies that went public during the first half of 1997, 24 percent of their venture financings occurred in 1996, 20 percent in 1995, and 13.5 percent in 1994. During 1996, 143 companies went public. The concentration of venture financings followed a similar pattern: 27 percent in 1995; 15 percent in 1994; and 17 percent in 1993. In addition, the majority of rounds closed in 1995 and 1996 correspond to high tech companies, which may explain why this group, not life sciences, experienced elevated pre-money valuations in those two years.

[7] The return will depend both on the increase of the company's equity value – as a proxy for investment value, without consideration of the effects of dilution – and the time between that financing round and the public offering. Therefore, given a value increase, the shorter the period of time between a round and the IPO, the greater the return received by investors.

[8] To participate in a mezzanine round, investors are often required to participate in prior rounds. By investing in earlier rounds, venture investors have the opportunity to participate in the attractive mezzanine round but also maintain – to some extent -- their ownership percentage of the company, thus reducing the dilution effects that the entrance of new investors may cause.

[9] The study does not analyze IPOs that occurred after June 20, 1997.

[10] The adjustment for lack of marketability observed in our data derives from venture capital transactions and may not reflect the adjustment that other types of investors (i.e., strategic investors) apply in their valuations.

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