Venture Capital Fund Performance and the IPO Market

Abstract

In this paper, the investment performance of a large database of venture funds is considered over a 28 year period. The results suggest that a portfolio of venture capital partnerships can provide an average return that is superior to the public equity market, although the individual fund returns are highly positively skewed. Absent these outliers, the level of fund performance is more inline with public equity market returns. This paper also establishes a link between public equity market conditions and venture capital returns. Finally, some preliminary evidence is provided of venture fund performance during and immediately following the dot.com bubble.

Introduction

The U.S. National Venture Capital Association (NVCA) was founded in 1974 by 78 firms with aggregate capital of barely half a billion US dollars.[1] Since that time, the industry has experienced remarkable growth and by December, 2006, there were 798 venture capital firms managing a total of $236 billion[2] making it one of the key asset categories in the alternative investments industry. Despite its importance however, relatively little is known about the experience of those who invest in venture capital funds. This is an important issue as the liquidity risk of venture funds is significantly greater than for any other class of asset insomuch as most venture funds have a contractual lifespan of ten years and there is a very limited secondary market to facilitate an early exit.

The most significant impediment to any research on the venture capital industry is a lack of suitable data, as partners are typically not subject to public disclosure requirements (see Denis, 2004, p. 320, for a discussion).[3] Despite this obstacle, a small literature has emerged that has attempted to provide insights into the venture industry, including characterising fund performance (see Phalippou, 2007, for a survey). For example, Cochrane, 2000, Quigley and Woodward, 2003 and Hwang, Quigley and Woodward, 2005, infer aggregate information about the performance of private equity investing using data on the returns to individual venture capital projects. Peng, 2001, Chen, Baeirl and Kaplan, 2002, Woodward and Hall, 2004, and Hwang, Quigley and Woodward, 2005 use a repeat valuation model to construct an index of venture capital from which overall industry performance may be inferred. A problem with these studies is that they do not take into account the timing of the cash flows or the risk profile of the investing companies. Gompers and Lerner (1997), Schmidt (2003) and, in particular, Ljungqvist and Richardson (2003) and Kaplan and Schoar (2005) attempt to overcome these problems by undertaking a more detailed level of analysis in which the individual investments of a fund are considered (see Section I for a detailed survey of the literature).

[1] American Research and Development Corp. is generally regarded as the first venture capital firm. It was launched in 1946 with the aim of commercialising technology developed during the war.
[2] Source: US National Venture Capital Association, 2006 Yearbook.
[3] Recently some fund-level data has been revealed by public sector pension funds subject to state-level "Sunshine Law" or "Freedom of Information Act" requirements.

The purpose of this paper is to characterise and explore the sources of investment performance in the venture industry. To this end, we draw on a unique proprietary database of the venture capital investments made by two major limited partners (LPs), which is provided on an anonymised basis. The dataset for one LP begins in 1980, while the other begins in 1985. Since their inception, these LPs have invested in a combined total of 387 venture funds, providing a rich database of information for analysis. Dated cash flow information is provided on all takedowns and disbursements throughout the life of each fund. The ability to examine dated disbursements to, and realizations from, individual venture funds distinguishes this paper from most of the previous literature that has attempted to analyse the returns to venture capital.

The sample of fund data is benchmarked using the Venture Expert database, and the investment activity of the LPs generally reflects the overall trends in the industry. Where the LPs do distinguish themselves however, is in their ability to generate a level of return that is superior to both that of the public equity market and the venture industry itself. These returns however, are highly positively skewed such that only a small number of extremely high performing funds are responsible for generating the excess returns. In the absence of these outliers, the level of fund performance is far less impressive and more inline with public equity market returns. Thus, although our LPs are not representative of the industry as a whole, we consider this to be a virtue of our study. By focusing on two high performing LPs, we are able to explore the source of excess returns in the industry. Further, the results help to explain the high degree of variation in venture returns reported in the literature. To put it simply, our LPs are above average performers and this status is a function of their ability to access a small number of funds that generate extreme returns. The majority of LPs however, are not be able to invest in these funds, as established general partners (GPs) typically only solicit investments from LPs with which they have long standing relationships. As a result, the average industry returns are similar to listed equity and only an elite group are able to outperform the public market.[4]

[4] Discussions with industry participants provide anecdotal support for this finding.

These findings raise a number of interesting questions about the supposed benefits of investing in the venture industry. In terms of the returns to venture investing, the majority of investors are unlikely to be able to access the select group of extremely high performing funds that are the key to out-performance. Thus, venture investing may not necessarily result in an enhanced expected portfolio return.

A second important contribution of this paper is to establish a link between public equity market conditions and venture capital returns. The early empirical and theoretical work on venture capital frequently assumed that the performance of private equity was independent of the public equity sector. A more recent literature has emerged that broadly identifies the state of the IPO market as a factor affecting venture capital returns. In this paper, we provide a detailed characterization of the evolving state of the venture IPO market through time and link this to venture fund performance. The results of this analysis suggest that the public equity market substantially influences venture returns. Specifically, the median IRR achieved when the IPO market is unfavourable at time of exit is 9%, whereas the median IRR for funds exiting in a favourable IPO environment was 76%. The observed correlation of venture returns with the public equity market may reduce the diversification benefits of a venture capital investment portfolio for institutional investors.

A third contribution of this study is to furnish some preliminary evidence of venture fund performance during and immediately following the dot.com bubble. The available data suggests that venture investing during the build up to the peak of the bubble was unprecedented in terms of the number of funds, the size of the investments made and the extraordinary levels of fund performance. Further, the number of venture-backed IPOs approached an all-time peak during this period. The most distinctive characteristic of the bubble was the unprecedented number of listings of unprofitable companies. The performance of the funds following the bursting of the bubble was dramatically lower compared to any time in the preceding 20 year sample period. This reversal coincided with a radical decline in the number of venture-backed IPOs and the almost complete inability to take unprofitable companies public.

The remainder of this paper is set out as follows. Section I surveys the relevant literature. Section II characterizes our set of venture funds in some detail. Section III

characterises the performance of the sample and compares it to the return on both public equity and the venture industry in general. Section IV considers the issue of the persistence in the returns of the funds. In Section V, the combined database of terminated and effectively terminated funds is used to explore the relationship between conditions in the public equity market and venture fund performance. Section VI considers the impact of the dot.com bubble on the venture industry. Finally, Section VII provides some concluding comments.

I. Literature Survey

The principal source of venture investment data is a commercial database maintained by the Venture Economics[5] (VE hereafter) unit of Thompson Financial group. This database contains aggregate information on voluntarily reported quarterly fund-level cash flows, self-estimated residual values and calculated rates of return, for a large number of venture funds. The VE database is useful when characterising the investment behaviour of private equity funds (its intended purpose). When estimating the returns to these funds however, the nature of the data presents a number of problems (see Ljungqvist and Richardson, 2003). Lerner, Schoar and Wongsunwai (2007) attempt to overcome this problem by combining the VE database with returns data sourced from Private Equity Intelligence as well as other databases that provide information on institutional characteristics. While this does create coverage issues (their IRR data is only available for 40% of the funds in the sample and the database from which they collect fund information changes is less complete in the early part of the sample period) and the data is focused on the lead up to the 2000 bubble period (only funds raised between 1991 and 1998 are included), they report a net average return to venture investment of 23.7%. Further, the authors document systematic differences in the returns across LPs, which they conclude is a function of different investment objectives and levels of sophistication across investors.

As an alternative to using aggregate data to estimate the performance of venture funds, a number of different approaches have been taken. Cochrane (2000), Quigley and Woodward (2003) and Hwang, Quigley and Woodward (2005) infer aggregate

[5] Formerly known as the Venture eXpert database. The authors would like to thank Thompson Reuters for providing access to this database.

information about the performance of private equity investing using data on the returns to individual venture capital projects. Cochrane (2000) argues that this approach overcomes the problem of selection bias, which is shown to distort estimated venture returns greatly: an uncorrected estimate of 698% is reduced to 59% after correction. Peng (2001) uses the same data as Cochrane (2000) to generate a venture capital index based on a repeat sampling method and finds an average geometric return of 55%. Chen, Baeirl and Kaplan (2002), Woodward and Hall (2004) and Hwang, Quigley and Woodward (2005) also use a repeat valuation model to construct an index of venture capital. Chen, Baeirl and Kaplan (2002) examined completed venture funds and reported a 45% annual average arithmetic return (13.38% annual compounded log average return) to their index.

Kaplan and Schoar (2005) take a much more direct route and access the underlying fund level data which VE use to derive their published aggregate performance data. This approach overcomes the problem of aggregation, but not the issues related to self-reporting. Their analysis of private equity fund performance over the period 1980 to 2001 documents a high degree of skew and persistence in venture capital returns. They also find that returns on average are not dissimilar to public equity as proxied by the S&P500 index. Jones and Rhodes-Kropf (2003) argue that, as VCs are forced to hold undiversified portfolios of illiquid assets, they should be compensated for their total risk and not just the idiosyncratic component. They analyse virtually the same database as Kaplan and Schoar (2005) and find that concentrated portfolios have higher returns, which is taken as evidence in support of their hypothesis. Hochberg, Ljungqvist and Lu (2007) also consider firm level VE data and find that better networked venture capital firms offer superior performance and greater survival rates. On a similar theme, Gomper, Kovner, Lerner and Scharfstein (2006) find that venture capital partners with more industry-specific experience tend to outperform their peers.

With the exception of Kaplan and Schoar, an important criticism of these studies is that they do not take into account the timing of the cash flows (see Ljungqvist and Richardson, 2003) or the risk profile of the investing companies. To overcome these problems requires a more detailed level of analysis, in which the individual investments of a fund are considered. Lerner, Schoar and Wongsunwai (2007, p. 737)

argue in favour of using cash flow data to estimate fund returns, even though they themselves did not have access to such detailed fund information.

Schmidt (2003) explores a unique dataset of precisely dated cash flows at the company level over the period 1970 to 2002. This data is supplied by the Centre of Private Equity Research, which collects detailed private equity data on a completely anonymous basis. The results show that the mean return to private equity only outperforms the Russell based US equity benchmark since the late 90's. Gompers and Lerner (1997) examine the investments of a single venture capital firm (both failures as well as successes), and report average annual returns of 30.5% gross of fees over the period 1972 – 1997. Problems related to selection bias (the firm still exists) and the authors' use of marking to market each investment in order to obtain the fund's market value, however, suggest some caution is required when interpreting the results.

Ljungqvist and Richardson (2003) provide an analysis of private equity returns based on actual cash flows using the investment record of a single large institutional investor. This data consists of complete cash flow records for all private equity investments made in 73 funds over the period 1981 to 2001. Ljungqvist and Richardson (2003) document an IRR of 19.8% and a positive risk adjusted premium of 5–6%, which they attribute to the illiquidity of this type of investment. One limitation of the data used in this study is that the investment objective of their institution was not solely limited to maximising returns. It also had a strategic aspect of building relationships with clients who would purchase services from the institution. A further problem is that their "sample represents a reasonable cross section of large buyout funds and a much smaller cross-section of venture funds" (p. 17). Specifically, only a quarter of the funds in the investment portfolio of the limited partner are venture funds. By way of comparison, 75% of all private equity funds in the VE database are venture focussed. Similarly, 15% of the limited partners capital was invested in venture funds, compared to 41.5% for all funds in the VE database. Thus, the bias of this sample toward buy-out funds limits the extent to which it is able to provide insights into the venture investment experience.

II. Venture Capital Fund Characteristics

The dataset in this paper is derived from the records of two large LPs, each of whom has been actively investing in venture capital funds for over 20 years. The investment objective of these LPs is limited solely to maximising their risk-adjusted returns, and both have a policy of not holding stock distributed from the General Partner (GP). This data was provided under the conditions of anonymity, which precludes us from revealing their names or details of the funds in which they invested. The LPs provide a complete record of the takedowns and disbursements for every fund on a cash-out (to the venture capital firm) and cash/stock-in (to the LP) basis up to the end of June 30, 2007.[6] As a result, these data are not subject to survivorship bias as all investments made by the LPs are included.[7] The data includes both terminated funds and residual value funds (i.e., those funds that have investments that are yet to be fully realised) giving a total of 387 funds.[8]

A summary of the number of funds in the database across each year is presented in Table I. Note that the data from 1980 through 1984 represents the activity of only one of the LPs, who invested in an average of six funds each year. Data on the second LPs venture investments begins in 1985. The first funds in the database have a vintage year of 1979 and made their first investment in 1980. The most recent fund in the sample commenced in 2002 and was terminated in early 2006 after only 3.2 years. This fund does not mark the end of the sample however, as the last fund to be terminated was fully redeemed in June 2007.[9]

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[6] The information does not include descriptions of the funds, which means that we do not know how representative our database is of the universe of venture capital funds in terms of the types of investments made (size, specific or general, industry focus) nor whether the fund is a first time or subsequent fund raised by the GP. Where possible, this data will be benchmarked against the wider industry to provide some insights as to how representative the sample is.

[7] Although it could be argued that since both of these LPs still exist, a second order survivorship bias is present.

[8] There is some overlap in the database where both LPs invested in the same fund, but this only occurred on a small number of occasions and does not serve to alter the results.

[9] The average terminated fund in the database commenced investing in 1989. While the takedown of most funds is 100% of committed capital, there is a small number of funds (7%) whose aggregate takedown is different from the amount committed. The biggest discrepancy is a fund from early in the sample period that only drew down 44% of the committed capital. This shortfall of takedown to commitment did not indicate a lack of performance however, as the fund did generate a return of almost seven times the initial investment. On one occasion an LP invested greater than the capital committed (115%) and this fund was also profitable.

The investment activity of the LPs is reasonably constant throughout the 1980s. There is a large drop in the combined venture investing activity of the LPs in the early 1990's, when the number of terminated funds fell back to typically 7 or fewer funds each year. Most of the funds raised over the last decade are still active, i.e. the GP has not yet fully drawn down the committed capital and/or a component of the investment returns is yet to be realised. The second column in Table I presents the number of active funds by vintage year. The bracketed terms are the number of active funds that may be classified as "effectively terminated"; that is, the residual fund value is less than 10% of the total distributions to date. From the total set of 251 active funds, we deem 69 to be effectively terminated, the residual value of which is unlikely materially to change the fund's performance metrics. As a guide to the net activity of the LPs over the entire sample period, the third column shows the total number of funds by vintage year.

To provide some sense of the activity of the LPs relative to the industry as a whole, Figure I presents a plot of the total number of funds in the database by vintage year and a plot of the number of new venture funds by vintage year as reported by VE. The overall correlation between these two series is 0.859 and the rate of investment by the LPs in new funds closely mirrors the overall trends in the number of new funds established in the industry. One notable exception was during the late 1980's, where the LPs were investing in an increasing number of funds whereas the number of new funds in the industry was relatively stable.

It is possible that the increased number of investments made during the period leading up to the dot.com boom may reflect a higher number of smaller investments designed to spread risk or take advantage of the myriad of opportunities that presented themselves during that period. To test this possibility, the latter part of Table I presents information on the average commitments of the LPs for terminated, active and all funds. It is clear from these figures that not only were the LPs investing in more funds, but that their average investment in the industry has also increased (the total investment figures mirrored this result). This is true for both terminated and active funds. In fact, around the time of the dot.com boom, the LPs invested in more funds and commited higher levels of capital than at any other time. These trends are reflected in the aggregate data: the amount of money committed to venture investing

rose from $10 billion in 1995 to $106 billion in 2000 before dropping back to less than $10 billion in 2002.[10] To benchmark this data against the overall industry trend, Figure II presents a plot of the average commitment for the LPs relative to the average size of a fund in the VE database. The correlation between these two series is 0.729 and both the LPs and the average size of the fund in the industry are closely linked. It is interesting to note that, during the bubble period when the average fund size increased markedly, the average commitment of the LPs was reasonably stable (although as previously discussed, they were investing in more funds).

Panel A and B of Table II presents a summary of the investment life-cycle of the 136 terminated and effectively terminated funds respectively.[11] The highly heterogeneous nature of the funds is reflected in these statistics, with each takedown percentage exhibiting a relatively large standard deviation and the range of takedowns covering a spectrum of 1 day (a sole initial investment is made with no further takedowns) to 11.76 years to be fully invested. These fund life metrics serve to highlight the typically long term nature of this type of investment. Gompers and Lerner (2004) report that the contractual life of most funds is typically around 10 years with the option to extend subject to mutual agreement. The 25th percentile fund in our terminated fund data has a life of 10.46 years, which suggests that a large proportion of funds will seek to extend their life beyond the initial agreed term.

Panel A and B of Table III presents a summary of the takedowns and distributions of the terminated and effectively terminated funds respectively. Focussing on the terminated funds, the average total takedown by a fund is $4.8 million, with most investments in the range of $1.7 to $6.0 million. With respect to the total distributions made by the GP to the LP, the average total distribution of $14.3 million is around 3 times greater than the average fund takedown and the median distribution of $7.4 million is around twice the median takedown. The distributions are highly variable however, as evidenced by the standard deviation of $22.6 million. While we do not

[10] NVCA 2007 Yearbook, Figure 2.02, p. 23.

[11] The average number of years till 25% of the committed capital is drawn down is 0.37, and the average fund was 50% drawn down after 1.30 years, 75% invested after an average of 2.24 years and fully invested after 4.61 years. The average fund is fully redeemed after 12.90 years and the standard deviation is 4.04 years, which highlights the highly variable nature of a venture fund's life. The longest fund in the sample had a life of almost 25 years before all investments were redeemed, while the fund with the shortest life was active for only 2.48 years.

know the absolute size of the funds, the ratio of total distributions to total takedowns to and from our LPs (the 'fund multiple') is a useful measure of fund performance, as discussed in Section III below.

The average terminated fund has 11 takedowns: most funds make between 4 and 15 calls against committed capital and the average takedown at each call is $0.524 million. To put these takedowns in context, it is possible to express the average size of a funds takedown relative to the total takedowns. The average takedown is 18% of the committed capital and most takedowns are between 7% and 25%. In some cases though, the takedown can be very small (the lowest is 2%) and the six funds with a sole takedown provide the upper limit of 100%.

The distributions from a venture fund can be in the form of either cash or stock. By definition, stock distributions follow on a company going public, and they are typically subject to a 180-day holding period covenant. Cash distributions on the other hand, can be generated by the sale of a company to an acquirer or by the sale of post-IPO stock on the market. Discussions with industry participants suggest that cash distributions are more likely to come from an acquisition, as GPs will typically distribute stock and leave it to the LP to decide whether to hold the stock or sell.

The distributions to the LPs by venture funds are typically well spread out across time (Table II). Panel A of Table III shows that the average number of distributions per fund is 30, with one fund making 108 distributions over a 9 year period. There are 11 cash distributions per fund on average, while for stock distributions, the average is 20. The average size of a distribution is $0.541 million, almost identical to the average takedown. The average size of a cash distribution is $0.396 million and the average size of a stock distribution is almost double ($0.582 million).

III. Venture Capital Fund Performance

The two most commonly used performance metrics are fund multiple, which measures the total distributions relative to the total takedown, and the internal rate of return (IRR), which takes into account the time value of money. Tables IV and V summarise venture fund performance using these two measures for the sample of

terminated and effectively terminated funds as well as a combined sample of funds. The following discussion shall focus solely on the IRR results, as a discussion of the estimated fund multiples does not furnish any additional insights and they are presented for the sake of completeness.

Table IV presents a summary of the IRR for the 136 terminated (Panel A) and effectively terminated (Panel B) funds. Panel B of Table IV also summarises the size (absolute and relative to the total distributions of the fund) of the residual for these effectively terminated funds. The median return for the terminated funds is 17%, the average return is 27%, with a maximum of 256% and a minimum of -94%. The standard deviation of the distribution is 44%. Most funds generated a positive return of between 7% and 33% while 19 funds had a negative IRR. The IRR of the effectively terminated funds (Panel B of Table IV) is extraordinary, with an average of 85% and a median of 61%. The lower degree of skew in this sub-sample suggests that the extreme market conditions of the Bubble years outweighed the idiosyncratic talents of the individual GPs. We return to consider the impact of the dotcom bubble more fully later in the paper.

The combined sample performance metrics (Table V) again illustrates the dispersion of returns, as the average IRR of 47% is almost twice the median IRR of 24%. The range of IRRs across these venture capital funds is substantial and serves to highlight the dispersion of the returns to this type of investing. By way of comparison, Kaplan and Schoar (2005) report a median (mean) venture fund IRR of 11% (17%), and a standard deviation of 34%, which is lower than the sample of funds that form the focus of this paper. Ljungqvist and Richardson (2003) report an average IRR of 19.8%, which is also substantially below the estimated mean IRR of the sample analysed in this paper. As will be discussed at greater length below, the performance of our sample is superior to that of the VC industry as a whole.

A notable feature of the venture fund performance metrics is the small number of extremely high performing funds, which result in high positive skewness coefficients. To characterise these outliers, each of Tables IV and V contains a summary of the top decile of the sample. The top decile of terminated funds ranked by IRR has an average value of 127% and the median is 93%, while the top decile of the effectively

terminated funds has an average IRR of 301% and a median IRR of 292%. The impact of these top performing funds on overall portfolio performance is considerable. To highlight the significance of this skewness of venture fund returns, the performance measures are re-estimated excluding the top decile of funds ranked by IRR or multiple. In this case, the median IRR for the terminated funds falls to 15% with a standard deviation of 22%, and, if the top quintile is excluded, the median IRR is 12% with a standard deviation of 19%. In both cases, the mean and median metric are very close. Again, excluding the top deciles and quintiles from the set of effectively terminated funds substantially reduces the IRRs: without the top decile the median IRR is 45% and the standard deviation is 56% and without the top quintile the median IRR is 39% and the top quintile is 45%.

A final observation on venture fund performance relates to the average fund performance through time. As stated in the introduction, the venture fund industry has grown considerably since the start of the data sample period. It is interesting to examine the average fund performance over time given this increasing competition in the industry. To this end, Table V presents a breakdown of these performance metric summaries by vintage year, where vintage year is arbitrarily split into the periods 1980 – 1984, 1985 – 1989, 1990 – 1994 and 1995 – 2006. It must be remembered that these funds are grouped by vintage year and the IRR relates to cash flows well into the future. Keeping this point in mind, both the average IRR and fund multiple have increased over time. For example, the average IRR for all funds with a vintage year of 1980 – 1984 is 17%. The funds raised in the second half of the 1980s had an average IRR of 23%, while for the first half of the 1990s, it is 42%. Finally, the most recent vintage group of funds has an average IRR of 86%. The skewness of these results however, biases these figures as the median IRR is below the mean in each period. The standard deviation of fund returns is also reported in Table V. Over each of the four periods distinguished, the standard deviation of the IRRs and fund multiple has increased. Thus, although the median returns vary across time, the average returns and the variability of the data have generally increased. This evidence clearly highlights the extreme skewness of the fund returns as an important characteristic of the data.

A. Public Equity Performance Compared to Venture Fund Performance

One of the most contentious issues in the venture capital literature is whether private equity outperforms public market equity and whether any alpha earned is sufficient to compensate the investor for the illiquidity of this type of investment and the risk that it carries. Our database of precisely dated venture fund cash flows provides an ideal opportunity to cast light on this issue, and in this paper the following process is adopted. For each terminated fund, the schedule of cash takedowns is retained. At each point in time a takedown occurs, however, it is assumed that an equivalent amount of money is invested in public equity. Redemptions from this hypothetical investment are matched to the date of the distribution from the venture fund. Specifically, a portion of the invested amount is redeemed that is equal to the percentage of total distribution received from the fund on that date. This money is assumed to be held at face value for the remaining life of the fund. In this way, a series of dated investments and redemptions is created that represents the return to the investor if he had invested his money in the public equity market rather than the venture fund. The public equity market in this case is proxied in the first instance by the S&P500. Due to the speculative nature of the type of firms a venture fund invests in, it is possible to argue that the NASDAQ market index is a more suitable proxy. Thus, both are considered.

Table VI presents a summary of these results for the terminated funds. The average fund multiple when the fund outflows are invested in the S&P500 is 2.00 and for the NASDAQ is 2.42, which are both below the 3.65 multiple generated for the actual funds themselves. Thus, the average return on investment in the S&P500 generated a doubling of the capital, whereas the venture funds generated a return that is well over triple the invested amount. The most noticeable difference between these hypothetical multiples and their actual values is the standard deviation of multiples across the set of hypothetical funds, which are 0.53 and 0.83 for the S&P500 and NASDAQ respectively. These are around fifteen times smaller than the distribution of the actual fund multiples. The range of observations provides further insights into this result, as the highest observed multiple for these proxy investments in the S&P500 is 3.85 (or 5.05 in the case of the NASDAQ), whereas the actual highest multiple generated is 96.10.

As an alternative method of assessing the relative performance of venture funds, it is possible to estimate the IRR of the cash flows from the hypothetical S&P500 and NASDAQ based investments: a summary of the estimates is presented in Table VI. The average IRR of the hypothetical S&P investment is 12%, which approximates the long term rate of return on the US stock market. The average IRR for the NASDAQ funds is 16%. The range of investment returns generally falls within a narrow band of between 11% and 14% for the S&P500 with a higher upper bound for the NASDAQ (21%). Some S&P500 based investments that had distributions that were focussed around the 2000 – 2002 dot.com build-up period did particularly well (the maximum is 27%) and those that were exposed to the downside of the bubble bursting did badly (the minimum is -17%), but these were certainly the exception, given that the majority of the funds were terminated prior to 1998. When the top decile and quintile of funds are excluded from these S&P500 and NASDAQ hypothetical investments, the average and median metrics only change by a relatively small amount. Thus, the skewness of these hypothetical funds is not nearly as influential as for the actual sample of venture funds.

To aid in the interpretation of these results, Figure III presents a plot of the IRR of each terminated fund against their respective S&P 500 based IRR. Any fund that falls on the solid line in the figure performs in line with the public equity market over the same period. Where a fund falls above the solid line, it outperforms the S&P500 and where it falls below the line, it underperforms relative to the return the same investment would have made in the S&P500 over the same period. The majority of funds are clustered around the 10% to 15% IRR nexus. A small but distinct group of high performing funds is clearly evident however, and it does not appear that their performance is contingent on the public equity market conditions. Thus, these results highlight the importance of a select group of funds that generate the skewness in the returns data and cause the mean and the median performance metric to deviate substantially.

A more direct comparison of the returns from a fund's distributions with those of the public market benchmarks is provided by Kaplan and Schoar's (2005) Public Market Equivalent (PME) metric. The PME is the total disbursements to a fund expressed

relative to the total distributions to a hypothetical investment in either the S&P500 or the NASDAQ index. A PME of greater than one signifies that the fund has outperformed its benchmark. A summary of this PME performance metric for the terminated funds is provided in Table VI. When the S&P500 is the public market benchmark, the average PME is 1.98, whereas for the NASDAQ it is 1.59. This means that the venture funds generated distributions that are on average 98% (59%) higher than the distributions generated by the S&P500 (NASDAQ) based investments. In some instances, the differences are quite marked as the maximum PME for the S&P benchmark is 58.44, while the minimum is 0.20. Not surprisingly, the standard deviation and skewness of the PME metric is quite high for the entire sample and excluding the top decile causes a marked fall in these estimates. Thus, these observations with respect to the PME reinforce the earlier discussion of the variance of venture fund returns relative to forms of public equity market investment.

Comparing these S&P500 and NASDAQ based IRR estimates to the actual average IRR of the venture investments (27%), it is clear that the sample of funds performed substantially better than the public equity market. Thus, in contrast to Moskowitz and Vissing-Jorgensen (2002), Gottschlag, Phalippou and Zollo (2004), Phalippou and Zollo (2005), Kaplan and Schoar (2005) and Phalippou and Gottschlag (2007), the evidence provided by the sample of funds in this paper finds that a portfolio of venture funds can offer a higher rate of return compared to public market equity. Another way of comparing these hypothetical public market investments to the sample of venture funds, however, is to use a simple measure of reward relative to the dispersion of returns. The average IRR of the venture funds expressed relative to the standard deviation of those returns is equal to 0.61. When the median fund return is used, the ratio falls to 0.38. By way of comparison, for the sample of hypothetical S&P investments the equivalent ratio is 2.0. When the Nasdaq is considered, the measure is equal to 1.6. Thus, while the high degree of skewness of the venture funds provides an average return that is well above that of public equity; once the variability of those returns is taken into consideration, public equity provides a superior variability-adjusted level of reward.

B. Venture Fund Performance Relative to the Industry

The analysis of the previous section provides clear evidence that the venture funds sampled in this paper outperform public market equity as proxied by either a general market index (S&P500) or a more speculative public equity market index (NASDAQ). This raises the question as to whether the investment track record of these LPs is representative of the industry as a whole. That is to say, do most LPs outperform the public equity market or do our LPs outperform their peers?

One possible approach to answering this question would be to replicate the hypothetical fund analysis of the previous section using a venture industry index in place of the S&P500 or NASDAQ indexes. While a number of attempts have been made to construct venture capital investment indices (see Peng, 2001, Chen, Baeirl and Kaplan, 2002, Woodward and Hall, 2003, and Hwang, Quigley and Woodward, 2003), our analysis will focus on the Woodward and Hall (2004) 'Sandhill' index, which is available over the period December, 1988 to the end of the sample period. This Sandhill data is based on firm level valuations and so provides gross return estimates. This creates a problem as the LP cash flow data used in this paper is net of fees. Thus, to provide a fair basis for comparison, some adjustment must be made to account for the likely fees a GP would receive. Metrick and Yasuda (2007) provide some guidance on this issue. In their study, they report that the average expected revenue for the general partners of venture funds per $100 of committed capital is $24.18 over the life of the fund. That is to say, a GP is likely to charge management fees and receive a share of profits ('carried interest') totalling 24.18% of committed capital, with the surplus distributed to the LPs.

For the sample of terminated venture funds, a matched hypothetical fund is created assuming that each fund takedown is invested in the market index. A redemption is made from each hypothetical fund at the time of the actual redemptions, assuming the money is invested in the venture capital market as proxied by the Sandhill venture index. This money is then held at face value for the remaining life of the fund. Thus, an equivalent set of cash flows is generated that mimic an equivalent investment in the general venture industry. Table VII presents a summary of this information and the average (median) IRR of the synthetic venture market investment is 33% (35%)

with a standard deviation of 20%.[12] Recall that Metrick and Yasuda (2007) suggest that the average income to the general partners is 24.18% of the gross return. This means that after fees, the venture industry provides an average net return of approximately 25% to the limited partners.

To provide a fair basis for comparison, the IRR of the sample of venture funds included in this paper must be calculated over the same period. To this end, Table VII presents the summary metrics for this restricted sample: the average net IRR for this subset of the data is 34%, with a standard deviation of 60%. Thus, the funds in the sample have outperformed relative to the Sandhill market benchmark adjusted for fees by 9%. The equivalent analysis based on the multiple performance metric for the synthetic industry funds provided an average investment multiple of 4.26 with a standard deviation of 2.56. The average multiple for the restricted sample of LP funds is 4.82 with a standard deviation of 12.37. Finally, in terms of the PME, the average is 1.24. Recall a PME of greater than one indicates out-performance relative to the specified benchmark and so this metric reinforces the IRR and multiple metrics that show the sample of venture funds have outperformed relative to the industry as measured by the Sandhill index.

An alternative approach to benchmarking the performance of our LPs may focus on the quarterly cash flow information provided by the VE database. Unfortunately, the aggregate nature of this data means that it is not possible to identify which cash flows belong to which fund. This means that the timing of the cash flows cannot be identified and so, a rate of return type analysis is not possible. It is possible however, to establish the aggregate multiple by vintage year by dividing the sum of the total distributions divided by the total takedowns for all funds raised in a particular vintage year. This measure therefore, provides a proxy for the average multiple earned across a sample of all funds raised in each vintage year.

Table VIII presents the aggregate multiple across all funds in the VE database for each vintage year in the sample period. For the first vintage year in the sample, $1.75 billion was taken down and $4.21 billion was distributed, giving a fund multiple of

[12] It should be noted that the volatility of the Sandhill Index is substantially lower than for other time series of venture performance.

2.40 for the 1980 vintage. The aggregate fund multiple drops to below 2 in the following year and remains at that level for the first half of the 1980's. The venture fund industry performance improved after 1985 and the fund multiples are consistently above 2 for the rest of this decade. The mid-90s is characterised by increasing multiples for funds raised during this period, peaking at 4.15 for funds with a vintage year of 1996. The more recent data must be interpreted with some caution as the declining multiples are not necessarily indicative of the dot.com boom and inferior performance. Recall that as the vintage year moves closer to 2007, a higher proportion of funds will have residual values. Thus, the multiple estimate is biased downwards, most obviously in the last year of the sample where no fund has made any distributions and the estimated multiple is zero.

To compare the LPs in this paper to this VE data, it is necessary to estimate the average multiple by vintage year for all funds in the database. Table VIII presents this information, and the trends observed for the VE database are mirrored in the investment experience of the LPs that form our sample (the correlation is 0.84). Specifically, after a period of declining performance in the early 1980's, fund performance progressively improved till the mid-1990's until the funds that are still active begin to dominate, causing the multiples to decline.

Comparing the industry to our LPs, it is interesting to note that the average LP multiple is greater than the industry average in every year except 1981, 1983, 1991 and 2004. That is, the total distributions from the venture funds in which the LPs have invested have exceeded the investment amount by more than the industry average in almost every year. Specifically, the fund multiple has been higher than the industry average by 181% across all the years in the sample and in some cases the difference has been very substantial. For example, the industry multiple for funds of vintage year 1996 is 4.15, where as for the LPs in this study the average multiple is 12.73, i.e., a difference of 307%.

In general, the results of Section III reveal that the average return for the sample of funds is above that of both the public equity market and also the industry itself. These excess returns are the result of a small number of extremely high performing

funds. In the absence of these outliers however, the level of fund performance is more in keeping with public equity market returns.

IV. Venture Fund Performance Persistence

The results of the previous section suggest a high degree of persistence in the out-performance of our LPs relative to the industry over a period covering more than a quarter of a century. By way of contrast, virtually no evidence of return persistence has been found in the context of the general equity funds management industry, even over much shorter periods of time (for a survey see Kazemi, Schneeweis and Pancholi, 2003 and more recently Bollen and Buse, 2005, and Wang, 2006). The persistence observed in this sample of data may well reflect the significant experience and contacts the LPs have accumulated after almost 30 years of investing, factors which Gomper, Kovner, Lerner and Scharfstein (2006), and Hochberg, Ljungqvist and Lu (2007) suggest are important elements to successful venture investing. For example, Lerner, Schoar and Wongsunwai (2007, p. 734) report that "anecdotes in the private equity industry suggest that established LPs often have prefential access to funds".

The combined sample of 205 terminated and effectively terminated funds captures the investment track record of the industry over a long period of time. This database may be used to provide some insights into the persistence of venture fund performance, which in this industry may be high as a successful GP is more likely to be able to raise a follow on fund. In this case, the performance of a fund may be related to its sequence number. To test this hypothesis, Kaplan and Schoar (2005) specify the following regression equation:

$$IRR_i = \beta_0 + \beta_1 IRR_{i-1} [+ \beta_2 IRR_{i-2}] + \varepsilon_t \quad (2)$$

that is, the IRR of fund *i* is regressed against the IRR of the GPs previous fund. The results of applying this regression equation to the sub-sample of funds for which we have sequence numbers are presented in Table IX, where all standard errors are corrected for serial correlation and heteroscedasticity. In the first column of results,

the regression equation only includes the IRR of the most recent fund and a positive and significant result is generated. The second column of Table IX presents the regression results where the two most recent funds are included as regressor terms and the first lagged fund retains its sign and significance; however, the second lagged fund is insignificant. A lack of data prevents higher lags of funds being tested. Table IX also includes the same set of regression output where the fund multiple is specified as the measure of performance. The results are qualitatively consistent to the IRR results as the one period lagged multiple is positive and significant and the second period lag is insignificant. These results are similar to those of Kaplan and Schoar (2005), except that their second lag fund IRR coefficient was also positive and significant. The outlier high performing funds in the sample provide an interesting example of fund performance persistence as eight of the top 10 funds ranked by IRR, produced a follow on fund that generated an IRR in excess of 100%. This is consistent with the evidence of Gompers Kovner Lerner and Scharfstein (2006a), who find that VCs with a track record of success are likely to be successful in the future. Thus, the data provides clear evidence of fund performance persistence and suggests that the past fund return is indicative of current fund performance.

V. Venture Fund Performance and the Public Equity Market

The early empirical and theoretical work on venture capital frequently assumed that the performance of private equity is independent of the public equity sector (see *inter alia* Cochrane, 2000) and many investment professionals also shared this belief. For example, Gompers and Lerner (2004, p. 354) state:

> "… many institutions … have increased their allocation to venture capital … in the belief that the returns of these funds are largely uncorrelated with the public markets."

More recently, this assumption has been called into question and a literature has evolved that considers venture capital investment performance in the context of

broader capital market conditions.[13] This includes the theoretical work of Inderst and Muller (2004) and, most relevant in the current context, the empirical research of Gompers, Kovner, Lerner and Scharfstein (2005) and Kaplan and Schoar (2005). The former explore the relationship between shifting valuations and activity in public and private equity markets and find "that an important component of volatility in venture capital investment activity is driven by volatility of fundamentals" (p. 3): further they observe that "…an increase in IPO activity from the bottom to the top quartile increases the number of [venture] investments by 22%" (p. 10). Kaplan and Schoar (2005, p. 1792) found evidence of substantial persistence of investment returns in both the venture and the LBO sectors. They link this persistence to market conditions and conclude that "…funds raised when market returns are higher are less likely to raise a follow-on fund …. This suggests that funds raised in boom times are more likely to perform poorly and, therefore, are unable to raise a follow-on fund".

A number of authors have gone a step further and specifically identified the state of the market for initial public offerings (IPOs) as a key driver of venture performance. For example, Metrick (2006, p. 100) argues:

> "Without a doubt, the most important driver of VC investment is the existence of a lucrative market to exit these investments. … The most profitable exits are achieved through initial public offerings."

Jeng and Wells (2000), Das, Jagannathan and Sarin (2003) and Gompers and Lerner (2004) link the state of the IPO market to the amount and profitability of venture capital investing. While these studies have broadly identified the state of the IPO market as a factor affecting venture capital returns, they stop short of actually undertaking a detailed characterization of the evolving state of the IPO market through time.

[13] A related literature has found links between the public and private equity sectors. For example, Lerner (1994) finds that biotechnology firms go public when equity market valuations are high. Barry (1998) finds that VC returns follow cycles of performance. Black and Gilson (1998) highlight the importance of an active stock market for growth of a VC industry. Phalippou and Zollo (2006) find that the performance of private equity funds is related to the state of the business cycle and the stock market.

A. Public Equity Market Classification

The goal of this section of the paper is to provide a formal analysis of the link between the public equity market and the performance of the venture investment industry. This necessitates the classification of the state of the IPO market. A number of different approaches to identifying a hot issue market have been used such as periods of high IPO returns (Ritter, 1984), NBER business cycle peaks (Choe, Masulis and Nanda, 1993) and scaled issue volume (Bayless and Chaplinsky, 1996). While useful, we argue that it is possible to specify a measure that is more appropriate in the current context.

Recall that venture capitalists will typically prefer to exit via an IPO.[14] Thus, a favourable market from a venture capitalists point of view is one which conditions are conducive to listing. In this case, IPO activity, or more specifically venture-backed IPO activity, is relevant. Further, the sooner the venture capitalist is able to exit the investment by bringing the firm to market, all other things being equal, the greater will be the IRR. Thus, the ideal state of the IPO market from the perspective of a venture capitalist is when it is possible to list a firm before it has become profitable. In this situation, venture capitalists are able to exit the investment and realise a return earlier than if they have to wait for the company to become profitable. Thus, the market classification measure needs to be based on the listing activity of venture-backed companies, including information on the profitability of these companies.

The VE database[15] has information on all US IPOs and includes a flag that denotes a firm as having received venture funding. This flag is used to distinguish VC from non VC-backed IPOs and uniquely identifies 3,032 VC-backed IPOs. For each of these companies, company financial information is acquired from a variety of sources. In the first instance, companies are identified in Compustat using SEDOL, CUSIP and ISIN identifiers and company profit information for the last financial year prior to

[14] Das, Jagannathan and Sarin (2003) report higher exit valuation for IPOs in comparison to exits by merger or acquisition. Ross and Isenstein (1988) report that a $1 investment in a firm that goes public provides an average cash return of $1.95 beyond the initial investment, while an acquisition yields a cash return of only 40 cents. Further, the option to exit via IPO improves bargaining power with any potential acquirer.

[15] The VE provides a database of 12,066 U.S. IPOs over the period 1980 to 2006, which compares reasonably with the Ritter IPO database of 11,209 companies over the same period.

listing is extracted as well as the year of listing. Thus, if a company listed on June 5, 1996 and its reporting date is December 31, the company financials to the year ended December, 1995 are recorded as the year prior to IPO. These financials represent the last complete set of corporate information for that company that investors would have had access to at the time the company was listing. The financials submitted for the year ended December 1996, are classified as belonging to the year of the IPO. Where a company could not be found in the Compustat database, the Osiris and Datastream databases are accessed. These alternative databases are used to verify the Compustat information as well as to fill in gaps where possible. Using this process, financial information for a total of 2375 companies is gathered, which represents 78% of our sample. Most of the missing data relates to companies that listed in the early part of the sample when company coverage across these three databases is the least complete. Nonetheless, we argue that this list of companies is sufficient to provide a representative cross section of the companies that were listing at the point in time and so allow us to characterise the market conditions with reasonable accuracy.

Figure IV presents a summary of the total number of IPOs, the total number of VC-backed IPOs and the total number of VC-backed IPOs that were unprofitable at the time of listing per quarter over the sample period (the Appendix presents the data in full). The number of VC-backed IPOs closely tracks the total IPO data: the correlation between the two series is 0.8436. On average, 24% of all IPOs coming to market in the sample period were VC-backed, although this varies from a high of 53% in 1999Q4 to a low of only 6% in 2002Q3. This data highlights how vulnerable GPs are to changing market fortunes in terms of their ability to exit an investment.

Examining the total number of IPOs, there are five distinct hot IPO markets that are identifiable: the peak of each occurs during the 1983Q4, 1986Q3, 1993Q4, 1996Q2 and 2000Q1 periods. It is interesting to note that the maximum number of IPOs during the dot.com bubble was actually the lowest of any of these hot-issue periods. This raises the issue as to what does distinguish the 2000 bubble market from other hot IPO markets, as these volume figures clearly demonstrate that it was not the number of IPOs.

To aid in the interpretation of this data, the lower panel in Figure IV presents the percentage of unprofitable VC-backed IPOs. The average across the sample is 41%. However, this ranges from only 3% in 1984Q4 to 83% in 2000Q4. The ability of VCs to bring firms that were unprofitable to market increased through the 1990s (the spike in 1990Q4 is a reflection of the small number of IPOs during this period) and peaked during the dot.com boom, when virtually all of the VC-backed listings were unprofitable. In the aftermath of the 2000 crash, the number of VC-backed IPOs fell to historically low levels (the 25 VC-backed IPOs in 2002 is the lowest for any year in the sample period) and the high percentage of unprofitable IPOs per quarter is a reflection of the small number of listings during this period. Thus, the 2000 bubble period is not distinguished by the number of companies that listed during this period, but the fact that an unprecedented number of unprofitable companies were coming to market during this time.[16]

To capture the state of the market, a classification system is used that distinguishes a poor issue market (=1, when less than 20 VC-backed IPOs occurs[17]), a normal issue market (=2, when at least 20 but less than 40 VC-backed IPOs occur), a hot issue market (=3, when more than 40 VC-backed IPOs occur) and an ultra-hot issue market (=4, when more than 40 VC-backed IPOs occur, more than 50% of which are unprofitable).[18] This last criteria identifies 1996Q2 and the period 1999Q2 to 2000Q3 as 'ultra-hot'. This VC IPO market indicator may be used to consider whether a link exists between the state of the public equity market and venture capital returns.

When venture capitalists invest in a firm, their return is a function of two factors. On the one hand, the return is a function of the amount of the company they are able to secure for their initial investment. This ownership percentage will reflect the competitive environment that prevails. If there is a lot of VC money chasing few deals, then the firm has the upper hand. Alternatively, where venture investing is out of favour and there are many deals chasing a limited supply of funds, the VCs have the upper hand and will be able to secure a better deal for their investment. The

[16] Ritter and Welch (2002) have also identified the size of the first day returns as a distinguishing feature of this period

[17] These categorisations are based on the standard deviation of the number of VC backed IPOs for which we have financial data, which is arbitrarily rounded down from 21.9 to 20 for ease of exposition.

[18] This classification system identifies hot and cold IPO markets that are generally consistent with those identified by Ritter (1984) and Bayless and Chaplinsky (1996).

evidence suggests that the volume of funds made available to the venture industry is directly linked to its performance, i.e., when the industry is doing well, people are more inclined to invest and so a greater supply of funds is available. Where venture funds are performing poorly, investors typically seek alternative investments and funding is limited. Thus, there is a direct link between the performance of VC funds and the amount of capital available for investment (see Gompers and Lerner, 2004, pp. 134-145). VCs will rationally wish to invest in a firm when the market is performing poorly and they are able to negotiate the best deals.

Once a VC has taken a stake in a company in return for an initial investment, the actual return on their investment is a direct function of how much is received for that stake on exit. If the firm is able to list at a time when the public equity market has an appetite for VC-backed IPOs, this equity stake is likely to be worth more compared to when the firm lists in a normal market. Ideally, the GP would want to list the company in an ultra-hot issue market and exit as soon as possible thereafter.

We have used the data on VC-backed IPOs to generate an indicator of market conditions at the time when investments are made and when distributions are received. As the investments and distributions are spaced irregularly through time however, it is necessary to weight the market conditions at the time of each cash flow by the proportion of total investment or distribution that it represents. This gives a weighted market conditions indicator on entry and exit for each fund. The lowest possible market condition score is a 1, which indicates that the all of the cash flows occurred in poor listing conditions. The highest possible score is a 4, which indicates that the cash flows occurred in a hot issue market when more than 50% of all VC-backed IPOs were unprofitable.

To provide an overall market conditions score for each fund, the exit indicator less the entry indicator is used. The optimal scenario is one in which the VC invests in the firm when there is a limited supply of money chasing deals and exits when there is a high demand for venture IPOs. In terms of the market classification system, the optimal scenario occurs when the market conditions on entry are equal to 1 and on exit are equal to 4. Thus, where the overall market conditions indicator is +3, there is little money chasing deals on entry and a ultra-hot issue market on exit. The worst

possible scenario for a VC fund is when the general market conditions indicator is -3, i.e. the fund has invested in an ultra-hot market and exited in a poor market.

Table X presents a summary of the entry, exit and overall market conditions indicator across all terminated and effectively terminated funds. The average entry (exit) conditions indicator across all funds is 2.19 (2.52) and most funds generated an indicator of between 1.60 (2.14) to 2.70 (2.98). The average market conditions metric across all funds is 0.33. That is, the difference between the capital weighted entry and exit conditions is small. The range of observations however, shows that for some funds, the entry and exit conditions were markedly different. The maximum value for the market conditions indicator is 2.36 and the minimum is -2.59.

B. Fund Performance and Market Conditions

If public equity market conditions affect venture returns, the best performing funds should be associated with a high positive market indicator and the worst performing funds should be associated with a high negative market indicator. Figure V presents a plot of the IRR and market conditions indicator for all terminated and effectively terminated funds, where the vintage year of each fund is highlighted with the use of different symbols. Most funds in the sample exited in market conditions more favourable than they entered, i.e. the average market conditions estimate is positive. For the funds that did get it wrong and exited in conditions that were less favourable compared to when they invested, most are from the more recent period that includes the bubble. Further, while a number of these funds did lose money, a few notable exceptions did well despite the market being against them. Finally, where a fund is associated with a positive market conditions parameter, while most generated a positive IRR, it is not true that more favourable market conditions guarantee a higher IRR. In fact, the funds that timed the market the best were very ordinary performing funds with positive, but relatively low IRRs. The correlation between the market conditions and the fund IRR across all of the data presented in Figure V is 0.102.

Panel A of Table XI presents a summary of the fund IRR and market conditions parameter. The median IRR when the fund market conditions are less than minus one

is 4%.[19] When the market conditions are neutral however, the median IRR is 27%. It is interesting to note that when the fund has entered and exited the market in favourable conditions (an indicator of greater than plus one), the median IRR is 20%, which is less than the median for the neutral indicator. One reason for this result may be the skewness of the data. The standard deviation of the neutral conditions data is 77%, which is higher than the standard deviation for the favourable and unfavourable market conditions data (60% and 52% respectively). Further, the range of observations for the neutral market data is large. To test the robustness of these results to the presence of these outliers, the top decile of funds in each category is excluded and a summary of this abbreviated dataset is presented in Panel B of Table XI. Focusing on the median IRR, the poor market conditions indicator has a median IRR of -2%. For the neutral and favourable market conditions indicator however, the same result is again evident in that both have a median IRR that is greater than where the market conditions are poor (24% and 18% respectively), but the favourable conditions median IRR is less than the neutral value. Thus, some evidence of poor market conditions impacting on venture fund returns can be found, although the evidence does not support the contention that favourable market conditions lead to higher returns.

Metrick (2006) suggests that exit conditions are an important influence on venture investment returns. This suggests that it may be more appropriate to focus on exit conditions rather than an overall measure of market conditions. To this end, Figure VI presents a plot of the market exit conditions and IRR for each fund, with the vintage year of each fund highlighted with the use of different symbols. The funds from the early 1980s and early 1990s are relatively clustered by exit conditions parameter. The late 1980s funds are very widely dispersed, however, and only a few high performing funds are present. The more recent period is characterised by funds that span the range of exit conditions and have some funds that have done exceptionally well, some that have performed poorly and still others that are more typical of the rest of the sample. The correlation between the exit conditions and the fund IRR across all of the data presented in Figure VI is 0.417. These results suggest that the exit conditions at the time of distributions are quite relevant in determining overall fund performance.

[19] The equivalent information based on the fund multiple is qualitatively consistent to that presented here and is not presented to conserve space.

To clarify this result, Panel A of Table XI also presents a summary of the fund IRR grouped by fund exit conditions. When the exit conditions are poor, the median IRR is 9%. Neutral exit conditions however, are associated with a median IRR of 24%. On the other hand, when the exit conditions are favourable, the median IRR is 76%. The standard deviation of these IRR estimates is similar for the poor and neutral exit conditions indicator (42%), however, it is much higher when the exit conditions are favourable (110%). This suggests that a small number of extremely high performing funds may be driving these results.

To test the robustness of these results to the skewness of the data, Panel B of Table XI presents a summary of the performance data, grouped by market conditions and exit conditions, with the top decile of funds excluded. The median IRR when the market conditions are unfavourable is -2%. When neutral market conditions prevail, the median IRR is 24%, which is greater than the median IRR when favourable market conditions prevail (18%). Where the data is categorised based on exit conditions, the results show that poor exit conditions are associated with an average IRR of 7%, neutral exit conditions produce a median IRR of 20% and favourable exit conditions generated an IRR of 69% (the skewness of the data is lowest of the three categories in this case).

Thus, the exclusion of the top decile of funds, in order to account for any bias caused by the skewness of the data, only serves to reinforce the full sample results discussed earlier. The results of this analysis suggest that while poor market conditions lessen the probability of a venture fund performing well, it is the exit conditions of a fund that are more likely to result in high rates of return to investment. In general, the data establishes a link between the conditions of the most relevant sector of the public equity market and venture fund performance.

VI. Venture Capital Funds and the Dot.Com Bubble

The dot.com boom represents a period of unprecedented activity in the venture capital industry. Specifically, the VE database reveals that more than double the number of funds were started during the 1999Q2 to 2000Q3 period in comparison to the first half

of that decade. Further, these peak years greatly exceeded the previous peaks reached in 1984 and 1987. NVCA industry data reveals that the number of fund and the dollars committed to the venture industry almost doubled in 1999 and doubled again in 2000. The LPs in this paper were also unusually active during this period both in terms of the number of funds they invested in and the average commitment to each fund (Table I).

It is an interesting empirical issue as to what impact this bubble period had on venture fund performance. Unfortunately, the long-term horizon of the investment cycle means that only in the fullness of time, will the impact of these events come to be fully understood. It is possible however to provide some preliminary insights using the sample of terminated funds and the subset of active funds that have a small residual value and may be considered effectively terminated. This combined sample of funds may be sorted based on the proportion of their redemptions that are made during the bubble period. Those that made a minimum of 50% of their distributions during the bubble period are selected for analysis. Using this criterion, we identified a total of 56 funds, and an examination of their characteristics reveals that they are similar to the larger sample of residual funds discussed in the previous section in terms of takedowns, distributions and life cycle. Consequently, the remainder of the analysis focuses solely on their performance metrics.

A summary of the performance metrics for all funds that had a minimum of 50% of their distributions during the bubble period is presented in Table XII. The average IRR (multiple) across these funds is 111% (7.94). This is the highest set of performance metrics for any subset of the data considered in this paper and is a reflection of the premium that this class of investment was generating during this period. Furthermore, the performance of venture funds during this period is not as skewed as the terminated fund sample. The median fund IRR is 91% and when the top decile of funds is excluded, the average IRR is 85% and the skewness coefficient falls to 0.51. An analysis of the fund multiple provides the same conclusions. This suggests that the fund performance during this dot.com period is not characterised by just a small number of outlier funds, but that funds were doing well virtually across the board (although two funds in this sample did lose money, both of which were relatively small).

The sample of terminated and effectively terminated funds may also be used to characterise the performance of the venture capital industry after the collapse of the bubble in 2001Q1. To this end, the sample of funds is sorted by the proportion of their distributions that occurred following the bubble period, and the funds with a proportion of greater than 50% are selected for analysis. Table XII presents a summary of the performance metrics for these 28 funds. The median IRR is -3%. When the top decile of funds are excluded from the sample, this falls further to -7%. These returns not only represent a dramatic reversal relative to performance during the bubble. They are also far below the returns generated by our terminated funds in all prior periods. The average multiple is 2.37, which is similar to the terminated fund average where the top decile is excluded (2.41). Excluding only three funds however, causes this average to fall by nearly 50% to 1.21. It should not come as a surprise that a number of post-bubble funds managed to generate profits (12 of the 28 funds are profitable) or that positive skewness still characterises the data. The end of the boom does not necessarily impose losses on venture capitalists. The drop in listing activity meant that it was more difficult to exit an investment through an IPO, but not impossible if a firm had sound financials. However, the number of VC-backed companies qualifying for listing was limited to those that were mature financially and the valuations achieved at offering were substantially below those of the bubble period. Returns for the set of post-bubble funds reflect these realities.

Our data permits one further exercise to explore the behaviour of venture capitalists during the bubble years: an investigation into the speed with which they invested the funds available to them or the intensity of investment. To construct a measure of investment intensity, the following process is specified. For each year in the sample, the available pool of capital is estimated as the sum of the amount of committed capital from previous years that has not yet been taken down by the GP and the capital committed for that year. The total takedown for that year is estimated as a composite of the sum of takedowns for funds of the current vintage year as well as takedowns from funds of previous vintage years that are still actively investing. The intensity of the fund takedown in a given year is the total takedown relative to the total amount of capital available for investment in that year. Table XIII presents the data and it is plotted in Figure VII. To provide an industry benchmark, the same information is

constructed using the VE database (note that the aggregate nature of the VE database means that it is not known which fund was drawing down in any given period, only the total value of the drawdowns).

The correlation between the investment intensity measure for the sample of funds and the VE data is 0.32. As the fund database only commences in 1980 whereas the VE database has data from 1969, the early part of the sample period may be biased for our sample of funds. The correlation between the two series from 1985 onwards is 0.660. A number of spikes in the intensity of the investment process may be observed in the data, which correspond to the data for 1983, 1994 and 1999 – 2000. It is interesting to note that each of these periods corresponds to the hot issue markets identified earlier. In particular, the bubble period is associated with an unprecedented level of investment activity which rose from 29% in 1996 (the sample low is only slightly less at 26% during the poor issue market of the late-1980s) to 64% in 1999 and the sample high of 71% in 2000. Thus, we find evidence to suggest that GPs increase the intensity of the rate at which they invest in response to market conditions.

In general, this evidence tends to suggest that not only is the listing activity of venture backed companies is high in a hot market (and by inference, the intensity of the distributions to LPs, should also be high), GPs must also pay higher prices to invest in new opportunities, which necessitates a larger drawdown of capital, i.e. a higher intensity of the investment process. The implication is that venture capitalists accelerate their investment activity in the hope of capturing the extraordinary returns being generated by a hot IPO market (a goal that is only transiently achieved).

It is unclear how representative these results are of the hundreds of venture funds that were raised and active during the dot.com bubble and the usual small sample caveats apply. In due course, once the funds active during this period have been terminated, a complete analysis of the impact of the dot.com bubble on venture returns can be undertaken and its impact understood. The preliminary results of this paper however, suggest that the level of venture investing during the bubble period was unprecedented and the returns to investors were extremely high. Following the bursting of the buddle however, the average return to venture funds has been the lowest observed during the sample period. In extreme form, the bubble period and

its aftermath illustrate the correlation between venture capital returns and the state of the IPO market.

VII. Conclusions

Venture capital is a significant part of the alternative investments industry. The lack of public reporting and readily available data, however, means that relatively little is known about venture funds and their track record of investment performance. In this paper, a database consisting of 136 terminated and 69 effectively terminated venture funds active over a 28 year sample period are considered. For each fund, the takedown and distributions are recorded on a cash-in and cash-out basis. As such, this sample overcomes many of the problems suffered by the previous literature in terms of using aggregated data or self-reported fund values.

This sample of fund data is used to characterise investments in the venture industry. In terms of the performance of venture funds, both an IRR and a fund multiple based performance metric are considered. The median IRR across all funds is 24%, while the median fund multiple is 2.66. The investment performance of venture funds relative to both public market equity (proxied by the S&P500 and NASDAQ) as well as the industry itself is considered and a number of conclusions can be drawn. First, our sample of venture funds outperforms both the S&P500 and NASDAQ over the sample period, albeit with very substantial dispersion of returns across the funds. Second, significant evidence of persistence in out-performance is observed, as the average fund multiple by vintage year is greater than that of the industry as measured using aggregate data sampled from the Thompson VE database and the Sandhill venture index. Third, a high degree of skewness is evident in the data, such that a small number of high performing funds are responsible for the bulk of the excess returns to the portfolio as a whole. Thus, our LPs enjoyed the benefit of having access to some of the top performers in the industry, and the consequent skewness of their venture portfolio returns is the decisive component of their alpha. This may help to explain why past studies may have not been able to find any evidence of venture funds outperforming the public equity market. If LPs are unable to secure an investment in the select grouping of high performing funds, they are unlikely to outperform any benchmark.

This paper also considers the relationship between the public equity market and the returns to venture investing. Historically, public equity market conditions have been proxied by the total number of IPOs. Given the focus of this paper however, the exit conditions are proxied by the total number of venture-backed IPOs with special attention given to the number of unprofitable venture IPOs to characterise the exit conditions for the industry. The number of venture-backed IPOs is found to correlate with the IPO market as a whole. The profitability of these IPOs, however, varies substantially, and the dot.com era in particular represented a unique environment, insofar as the number of unprofitable venture backed IPOs was noticeably higher than in any other period since 1980 and, in some quarters, was close to 100%. Using a measure of exit conditions based on the number of venture backed IPOs and their profitability, the evidence presented in this paper suggests that the public equity market substantially influences venture returns. Specifically, the median IRR realised when investments have been made in a competitive market and redeemed in an unfavourable market is 4%. On the other hand, the median IRR is 20% when the investments are made at a time when there is a shortage of such funds and the distributions are made at a time of favourable valuations. However, the most important element of the investment conditions are those prevailing at the time of exit, which cause IRRs to vary substantially: from a median return of 9% in a poor IPO market environment to a median return of 76% in an ultra-hot IPO market

The results reported in this paper on the relationship between VC returns and the state of the IPO market suggest certain directions for future research. Specifically, the criteria for gaining access to the IPO market have varied greatly over time. Analysis of those criteria and their determinants may provide insight into the context in which the venture capital industry continues to evolve. An extended period of time in which the availability of the IPO market is strictly limited to more mature, profitable companies has negative implications both for prospective VC returns and eventually for the flow of funds to the VC industry.

Finally, some preliminary evidence of venture fund performance during and immediately following the dot.com bubble is presented. Given the life cycle of venture funds, only a relatively small number of terminated funds exist that cover this

period. Using a sample of active funds and self-reported residual values, it is possible to make some observations about this period. First, venture investing during this period was unprecedented both in terms of the number of funds and the size of the investments made. Second, fund performance during the bubble was extraordinary, and the average performance of the funds is less driven by outliers as a large proportion of funds did well during this period. Third, the rational desire to take advantage of Bubble conditions in the IPO market is reflected in the increased investment intensity during that period.

Such performance reflected unprecedented access to the IPO market for unprofitable venture-backed companies. The performance of the funds following the bursting of the bubble was dramatically lower not only relative to the bubble period but also to all periods prior to the bubble. This reversal coincided with a radical constriction of the IPO market and its near absolute closure to unprofitable venture-backed companies.

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Table I
Summary of Fund Database by Year

This table presents a summary of the number of terminated, active and effectively terminated funds in the database by vintage year. Further, the average commitment of the LP to a fund is summarised by fund status and vintage year.

	Number of Funds				Average Commitment (000's)		
Year	Terminated Funds	Active Funds (Effectively Terminated)		All Funds	Terminated Funds	Active Funds	All Funds
1980*	6			6	877		877
1981*	5			5	1,620		1,620
1982*	5			5	2,400		2,400
1983*	6			6	1,416		1,416
1984*	6	1	(1)	7	2,100	3,000	2,228
1985	9			9	3,158		3,158
1986	15			15	3,331		3,331
1987	13	3	(3)	16	3,196	3,000	3,170
1988	11	3	(2)	14	4,777	3,333	4,468
1989	12	2	(2)	14	6,041	4,000	5,749
1990	4			4	7,033		7,033
1991	4	1	(1)	5	7,720	4,000	6,976
1992	7	4	(4)	11	4,823	5,000	4,862
1993	5	2	(2)	7	5,171	11,750	7,051
1994	4	8	(8)	12	4,205	8,511	6,789
1995	6	9	(9)	15	6,928	5,730	6,243
1996	3	8	(7)	12	14,728	13,708	14,048
1997	3	11	(9)	14	6,422	11,471	9,956
1998	4	17	(11)	21	10,916	10,409	10,544
1999	5	29	(4)	34	12,941	15,357	14,721
2000	1	39	(6)	40	18,422	10,176	10,568
2001		22		22		11,825	11,825
2002	2	9		11	814	10,542	7,299
2003		9		9		19,837	19,837
2004		12		12		21,497	21,497
2005		20		20		17,907	17,907
2006		31		31		16,159	16,159
2007		11		10		16,034	16,034
Total	136	251	(69)	387	-	-	-

Note: * - only 1 Limited Partner was active during this period

: Effectively Terminated Funds are those funds that have a residual value of less than 10% of the total distributions.

Table II
Fund Takedown and Distribution Cycle Summary

This table summarises the time taken for a fund to takedown the committed capital across the sample of terminated and effectively terminated funds. The amount of time taken to distribute a given percentile of the total distributions is also presented. Panel B summarises this information for the effectively terminated sample of funds. Panel C summarises the takedown and distributions of the venture funds by year.

	Takedown				Distribution			
	25%	**50%**	**75%**	**100%**	**25%**	**50%**	**75%**	**100%**
Panel A: Terminated Funds								
Average	0.37	1.30	2.24	4.61	4.94	6.48	7.95	12.90
Median	0.06	1.27	2.19	4.13	5.13	6.68	8.19	12.94
Stdev	0.48	1.07	1.39	2.55	1.95	2.12	2.47	4.04
25^{th} Percentile	0.00	0.42	1.22	2.86	3.57	4.82	6.40	10.46
75^{th} Percentile	0.72	1.91	3.15	6.18	6.42	8.16	9.62	15.32
Max	2.53	7.65	9.01	11.61	8.69	10.75	12.97	24.58
Min	0.00	0.00	0.00	0.00	0.00	1.34	2.16	2.48
Panel B: Effectively Terminated Funds								
Average	0.59	1.51	2.29	4.83	3.90	4.50	5.43	10.60
Median	0.52	1.35	2.13	4.34	3.67	4.10	5.02	10.45
Stdev	0.54	1.10	1.28	2.46	2.10	2.38	2.78	3.62
25^{th} Percentile	0.18	0.93	1.52	3.08	2.23	2.66	3.63	8.13
75^{th} Percentile	0.75	2.09	2.82	5.98	5.25	5.87	6.50	12.20
Max	2.98	5.99	6.14	11.76	11.33	11.68	14.99	23.24
Min	0.00	0.00	0.00	0.00	0.00	0.22	1.00	4.01

Note: all figures are in years

Table III
Summary of Fund Takedown and Distributions

This table summarises the takedowns and distributions of the sample of terminated and effectively terminated funds in the sample.

			TakeDown			Distributions					
	Total Takedown	Total Distributions	Number	Size	Size/Total Takedown	Number	Number (Cash)	Number (Stock)	Size	Size (Cash)	Size (Stock)
Panel A: Terminated Funds											
Average	4,855,667	14,383,297	11	524,010	18%	30	11	20	541,392	396,210	582,467
Median	3,775,000	7,499,962	9	428,571	11%	28	8	13	301,614	218,353	325,018
Stdev	4,704,654	22,611,150	8	437,000	20%	20	8	18	709,660	578,288	775,432
25th Percentile	1,754,344	3,186,464	4	276,810	7%	15	5	7	156,905	81,343	157,123
75th Percentile	6,003,221	16,037,387	15	585,558	25%	41	14	28	582,847	521,350	601,962
Max	29,179,400	206,164,273	45	3,000,000	100%	108	34	76	4,624,042	4,624,042	4,708,884
Min	400,000	284,006	1	699	2%	1	1	0	31,043	8,565	0
Panel B: Effectively Terminated Funds											
Average	9,903,562	66,451,561	15	856,079	9%	42	13	28	1,822,875	524,944	2,404,010
Median	6,999,999	22,950,101	17	526,316	6%	32	7	22	997,830	313,418	1,079,337
Stdev	8,420,531	93,107,917	7	1,279,736	10%	37	19	26	2,312,773	547,529	3,013,469
25th Percentile	5,000,000	8,963,051	11	307,692	5%	18	4	11	287,378	164,133	415,357
75th Percentile	13,125,000	82,425,988	19	839,588	9%	50	13	38	2,525,460	834,378	3,542,579
Max	52,011,904	443,267,157	40	9,250,000	50%	244	114	130	11,011,571	3,217,244	14,880,744
Min	806,100	655,204	2	38,386	3%	7	0	0	19,271	4,900	3,384

Table IV
Summary of Venture Fund Performance

Panel A and B of this table summarises the performance of the terminated and effectively terminated funds in the database, respectively. The residual value of the terminated funds in the database is also summarised at the end of the table, both in nominal terms and also as a percentage of the total distributions of the fund as at the end of the sample period.

	Average	Median	St. Dev.	Skewness	25th Percentile	75th Percentile	Max.	Min.
Panel A: Terminated Funds								
Fund Multiple	3.65	2.34	8.33	10.31	1.50	3.93	96.10	0.18
- Top decile only	14.42	7.24	23.72	3.63	6.69	8.13	96.10	6.29
- Excluding top decile	2.41	2.01	1.43	0.75	1.42	3.15	5.97	0.18
- Excluding top quintile	2.04	1.89	1.03	0.30	1.22	2.77	4.25	0.18
IRR	27%	17%	44%	2.49	7%	33%	256%	-94%
- Top decile only	127%	93%	63%	1.12	82%	160%	256%	71%
- Excluding top decile	15%	15%	22%	-1.06	6%	28%	70%	-94%
- Excluding top quintile	11%	12%	19%	-2.11	4%	24%	39%	-94%
Panel B: Effectively Terminated Funds								
Fund Multiple								
- Effectively Terminated Funds	5.82	3.76	6.13	2.08	1.82	6.50	32.45	0.58
- Top decile	20.26	17.26	5.88	1.87	16.86	21.31	32.45	15.76
- Excluding top decile	4.19	3.33	3.45	1.56	1.74	5.69	14.85	0.58
- Excluding top quintile	3.19	2.90	1.94	0.57	1.65	4.23	7.55	0.58
IRR								
- Effectively Terminated Funds	85%	61%	96%	1.98	15%	125%	515%	-22%
- Top decile	301%	292%	108%	1.42	228%	323%	515%	200%
- Excluding top decile	61%	45%	56%	0.54	15%	108%	193%	-22%
- Excluding top quintile	48%	39%	45%	0.42	12%	85%	133%	-22%
Residual	1,355,340	485,883	2,133,199	-	108,155	1,271,694	9,735,209	1,565
Residual / Total Distributions	3%	2%	3%	-	1%	5%	10%	0%

Table V

Performance Summary of Combined Sample of Terminated and Effectively Terminated Venture Funds

This table summarises the combined performance of the terminated and effectively terminated funds in the database. These metrics are also estimated for the top decile of funds and the database excluding the top decile and quintile of funds. A summary of the funds by vintage year is also provided to allow insights into the performance of the funds over time.

	Average	Median	St. Dev.	Skewness	25th Percentile	75th Percentile	Max.	Min.
Fund Multiple								
- Terminated and Effectively Terminated Funds	4.38	2.66	7.72	8.79	1.62	4.99	96.1	0.18
- Top decile	18.17	14.82	18.86	3.86	9.27	17.26	96.1	7.55
- Excluding top decile	2.8	2.34	1.78	0.79	1.5	3.84	7.28	0.18
- Excluding top quintile	2.34	2.01	1.3	0.55	1.34	3.23	5.49	0.18
- 1980 – 1984	2.33	1.83	1.56	2.04	1.43	2.57	7.28	0.59
- 1985 – 1989	3.07	2.66	1.68	0.69	1.89	3.98	7.6	0.57
- 1990 – 1994	5.07	2.99	6.13	3.07	1.86	5.81	32.45	0.53
- 1995 – 2006	6.18	3.12	12.25	6.22	1.1	6.49	96.1	0.18
IRR								
- Terminated and Effectively Terminated Funds	47%	24%	72%	2.74	9%	61%	515%	-94%
- Top decile	215%	193%	92%	1.97	155%	254%	515%	133%
- Excluding top decile	27%	20%	35%	0.69	7%	41%	125%	-94%
- Excluding top quintile	18%	16%	24%	-0.46	6%	31%	76%	-94%
- 1980 – 1984	17%	9%	23%	2.1	4%	20%	92%	-5%
- 1985 – 1989	23%	19%	26%	2.06	11%	32%	155%	-57%
- 1990 – 1994	42%	37%	40%	-0.37	17%	64%	125%	-94%
- 1995 - 2006	86%	55%	107%	1.48	4%	136%	515%	-34%

Table VI
Venture Fund Performance Relative to the Public Equity Market

Fund Multiple and IRR measures of performance are estimated for a hypothetical set of funds that are created assuming that each terminated fund in the database made an equivalent investment in either the S&P500 or the NASDAQ. The Public Market Equivalent (PME) is a measure of the total disbursements to a fund expressed relative to the total distributions to the hypothetical fund. This data is also summarised excluding the top decile and quintile of funds.

	Average	Median	St. Dev.	Skewness	25th Percentile	75th Percentile	Max.	Min.
S&P500 Multiple	2.00	2.06	0.53	-0.05	1.75	2.29	3.85	0.73
- Excluding top decile	1.90	1.98	0.44	-0.87	1.71	2.21	2.52	0.73
- Excluding top quintile	1.82	1.91	0.41	-0.96	1.65	2.14	2.33	0.73
S&P500 IRR	12%	12%	6%	-1.28	11%	14%	27%	-17%
- Excluding top decile	11%	12%	5%	-2.50	11%	13%	19%	-17%
- Excluding top quintile	10%	12%	5%	-3.00	10%	13%	15%	-17%
S&P500 PME	1.98	1.21	5.07	10.43	0.68	1.88	58.44	0.20
- Excluding top decile	1.23	1.02	0.74	0.89	0.64	1.64	3.11	0.20
- Excluding top quintile	1.03	0.92	0.52	0.43	0.57	1.41	2.25	0.20
Nasdaq Multiple	2.42	2.38	0.83	0.39	1.96	2.82	5.05	0.63
- Excluding top decile	2.23	2.27	0.63	-0.69	1.92	2.71	3.27	0.63
- Excluding top quintile	2.12	2.21	0.58	-0.90	1.86	2.58	2.92	0.63
Nasdaq IRR	16%	15%	10%	-0.24	11%	21%	45%	-24%
- Excluding top decile	14%	14%	8%	-1.50	11%	19%	28%	-24%
- Excluding top quintile	13%	13%	7%	-2.02	11%	17%	23%	-24%
Nasdaq PME	1.59	1.00	3.67	10.33	0.57	1.68	42.36	0.14
- Excluding top decile	1.02	0.93	0.57	0.66	0.57	1.33	2.48	0.14
- Excluding top quintile	0.88	0.83	0.43	0.44	0.54	1.19	1.85	0.14

Table VII
Venture Fund Performance Relative to the Industry (1989 – 2006)

Fund Multiple and IRR measures of performance are estimated for a hypothetical set of funds that are created assuming that each fund in the database with a vintage year of 1989 or later, made an equivalent investment in the Sandhill venture industry benchmark index. A summary of the multiple and IRR measures of performance for venture funds in the database is also presented over the restricted sample period. The Public Market Equivalent (PME) is a measure of the total disbursements to a fund expressed relative to the total distributions to the hypothetical fund.

	Average	Median	St. Dev.	Skewness	25th Percentile	75th Percentile	Max.	Min.
Fund Multiple	4.82	2.68	12.37	8.34	1.12	5.11	96.10	0.18
Fund Multiple (Sandhill)	4.26	4.26	2.56	0.46	2.27	6.29	11.51	0.62
IRR	34%	25%	60%	1.97	6%	46%	256%	-94%
IRR (Sandhill)	33%	35%	20%	-0.72	27%	49%	70%	-25%
PME (Sandhill)	1.24	0.67	2.85	6.99	0.38	1.17	22.23	0.11

Table VIII
Average Fund Multiple by Vintage Year Compared to the Industry

The following table summarises the average multiple by vintage year across all terminated and active funds in the database. This may be compared to an industry benchmark that is proxied by the average fund multiple for all funds in the Venture Economics database grouped by vintage year.

Year	Average Fund Multiple	Average VE Multiple	No. of Funds in VE Database
1980	4.53	2.40	18
1981	1.40	1.88	22
1982	1.61	1.39	28
1983	1.68	1.75	59
1984	2.12	1.43	66
1985	2.26	1.95	46
1986	3.25	2.53	43
1987	3.24	2.34	63
1988	2.68	2.52	44
1989	3.59	2.32	54
1990	4.95	2.79	22
1991	2.63	2.74	18
1992	2.86	2.71	26
1993	4.84	3.65	40
1994	8.91	3.37	40
1995	11.21	3.68	49
1996	12.73	4.15	35
1997	4.50	2.15	60
1998	3.65	1.26	77
1999	0.77	0.36	110
2000	0.45	0.29	119
2001	0.29	0.26	54
2002	0.25	0.15	18
2003	0.43	0.06	14
2004	0.05	0.09	20
2005	0.04	0.03	9
2006	0.01	0.00	9

Table IX
Fund Performance Persistence

The following table summarises the output from a regression equation that measures fund performance persistence. The current fund performance is regressed against the performance of the previous GPs fund(s).

Dependent Variable	IRR_i	IRR_i		$Multiple_i$	$Multiple_i$
IRR_{i-1}	0.6313	0.4088	$Multiple_{i-1}$	0.5269	0.4771
	(6.01)	(2.17)		(6.77)	(5.61)
IRR_{i-2}		-0.1330	$Multiple_{i-2}$		-0.0923
		(0.34)			(1.04)
Adjusted R^2	0.2438	0.1065	Adjusted R^2	0.2464	0.1568
No. of Obs.	110	61	No. of Obs.	110	61

Note: absolute values of t-statistics are reported in parentheses.

: all standard errors are corrected for serial correlation and heteroscedasticity

Table X
Venture Fund Performance (IRR) Relative to the State of the Market

This table summarises the fund market conditions indicator which measures the state of the IPO market at the time the fund invested and redeemed those investments. The fund exit conditions indicator focuses solely on measuring the IPO market conditions at the time the fund distributions are made. The performance of the funds, as measured by the IRR, is summarised by market and exit conditions indicators in Panel B. The same set of summary metrics are presented in Panel C, where the top decile of funds of funds are excluded.

	Average	Median	St. Dev.	25th Percentile	75th Percentile	Max	Min
Investment Conditions Summary							
Entry Conditions	2.19	2.20	0.70	1.60	2.70	3.94	1.00
Exit Conditions	2.52	2.60	0.67	2.14	2.98	3.94	1.00
Market Conditions	0.33	0.42	0.90	-0.00	0.91	2.36	-2.59

Table XI
Venture Fund Performance (IRR) Relative to the IPO Market

The performance of the sample of venture funds, as measured by the IRR, is summarised by market and exit conditions indicators in Panel A. The same set of summary metrics are presented in Panel B, where the top decile of funds of funds are excluded.

	Average	Median	St. Dev.	Skewness	25th Percentile	75th Percentile	Max	Min
Panel A: IRR Summary by Market and Exit Conditions								
- Market Conditions < -1	22%	4%	52%	1.28	-15%	39%	141%	-30%
- Market Conditions = -1 to 1	51%	27%	77%	2.75	9%	65%	515%	-94%
- Market Conditions > 1	41%	20%	60%	2.52	10%	32%	256%	-10%
- Exit Conditions <2	19%	9%	42%	1.60	-7%	29%	155%	-34%
- Exit Conditions = 2 to 3	33%	24%	42%	1.93	11%	40%	237%	-94%
- Exit Conditions >3	106%	76%	110%	1.56	22%	167%	515%	-6%
Panel B: IRR Summary by Market and Exit Conditions (excluding top decile)								
- Market Conditions < -1	9%	-2%	37%	1.69	-16%	29%	116%	-30%
- Market Conditions = -1 to 1	31%	24%	36%	0.60	8%	44%	133%	-94%
- Market Conditions > 1	23%	18%	25%	1.62	9%	27%	94%	-10%
- Exit Conditions <2	6%	7%	23%	0.86	-9%	15%	83%	-34%
- Exit Conditions = 2 to 3	22%	20%	23%	-1.20	10%	33%	71%	-94%
- Exit Conditions >3	78%	69%	70%	0.64	18%	130%	254%	-6%

Table XII
The Bubble and Venture Fund Performance: 1998 – 2002

The following table summarises the performance of funds that were active during the bubble and post bubble periods. To be considered active during the bubble period, a fund had to have made more than 50% of its distributions during the 1999Q2 – 2000Q3 period. To be considered active during the post-bubble period, a fund had to have made more than 50% of its distributions after 2000Q4.

	Bubble Funds				Post-Bubble Funds			
	Full Sample		Excluding Top Decile		Full Sample		Excluding Top Decile	
	IRR	Multiple	IRR	Multiple	IRR	Multiple	IRR	Multiple
Average	111%	7.94	85%	5.05	8%	2.37	-3%	1.21
Median	91%	4.66	78%	4.14	-3%	0.89	-7%	0.85
Stdev	100%	13.15	61%	3.73	38%	3.83	20%	1.18
Skewness	1.68	5.71	0.51	1.41	1.82	2.78	0.79	1.15
25th Percentile	39%	2.73	33%	2.12	-15%	0.64	-16%	0.58
75th Percentile	146%	7.73	131%	6.47	11%	1.70	7%	1.33
Max	515%	96.10	237%	16.69	116%	14.85	42%	6.13
Min	-2%	0.97	-2%	0.97	-34%	0.18	-34%	0.18
No. Obs.	56	56	50	50	28	28	25	25

Table XIII
Investment Intensity by Vintage Year of Fund

Table XIII presents a measure of the investment intensity of the fund database as well as the equivalent metric for all the funds in the VE database.

Year	Number of Funds	Fund Investment Intensity	VE Fund Investment Intensity
1980	6	56%	16%
1981	5	40%	21%
1982	5	52%	27%
1983	6	58%	28%
1984	7	40%	29%
1985	9	36%	28%
1986	15	39%	32%
1987	16	42%	34%
1988	13	30%	30%
1989	14	26%	24%
1990	4	27%	25%
1991	5	36%	26%
1992	11	36%	33%
1993	7	45%	31%
1994	12	29%	22%
1995	15	35%	27%
1996	10	29%	32%
1997	12	30%	30%
1998	15	39%	28%
1999	9	64%	38%
2000	7	71%	42%
2001	0	58%	26%
2002	2	42%	27%

Note: n/a – insufficient data

Figure I
LP Investment Activity Compared to the Industry – Number of Funds

The figure presents a plot of the total number of funds in the database by year compared to the total number of new VC funds being raised by year as reported in the Venture Economics database.

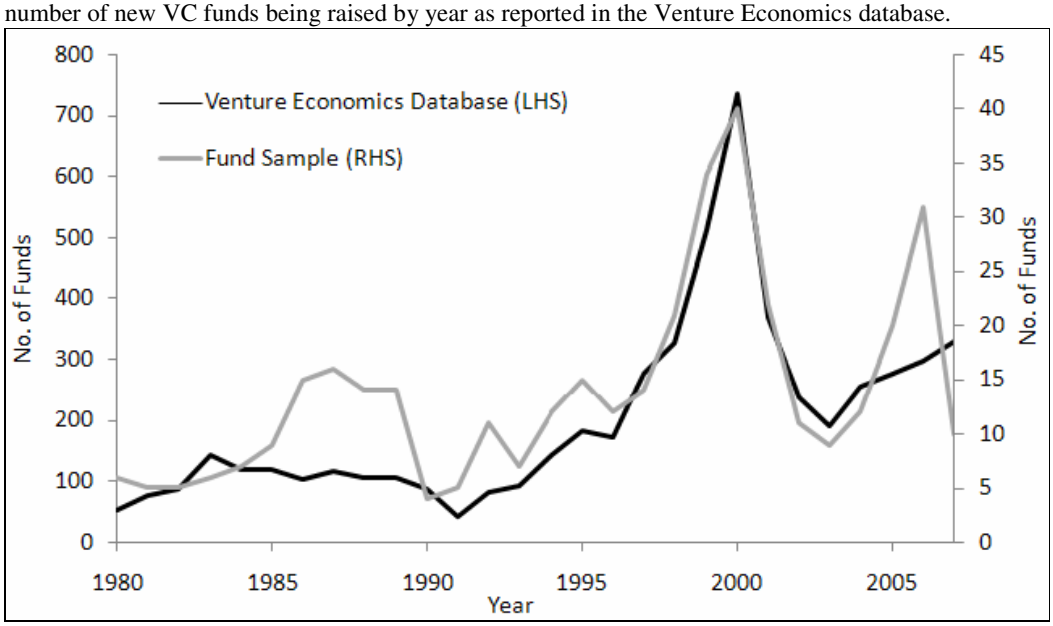


Figure II

LP Investment Activity Compared to the Industry – Fund Commitment

The figure presents a plot of the average commitment to each fund in the database by year compared to the average size of each new VC fund being raised by year as reported in the Venture Economics database.

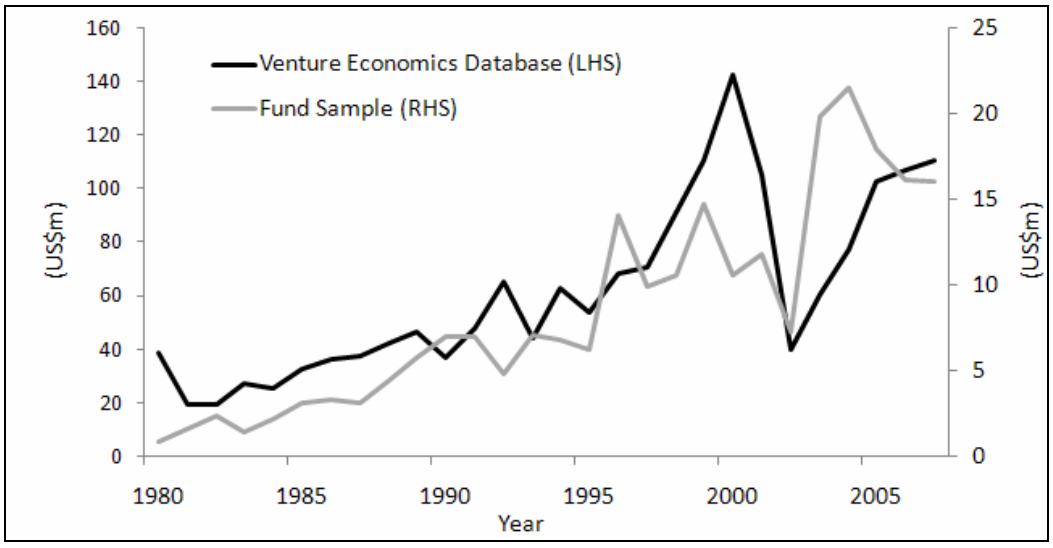


Figure III
Venture Fund IRR and Equivalent S&P500 Based IRR

The estimated IRR of each terminated venture fund is plotted against the estimated IRR where an equivalent investment is made in the S&P500. The solid line shows the equivalence between the two IRRs, such that where a fund generates an IRR that is superior (inferior) to an equivalent investment in the public equity market, its plot will fall above (below) the solid line.

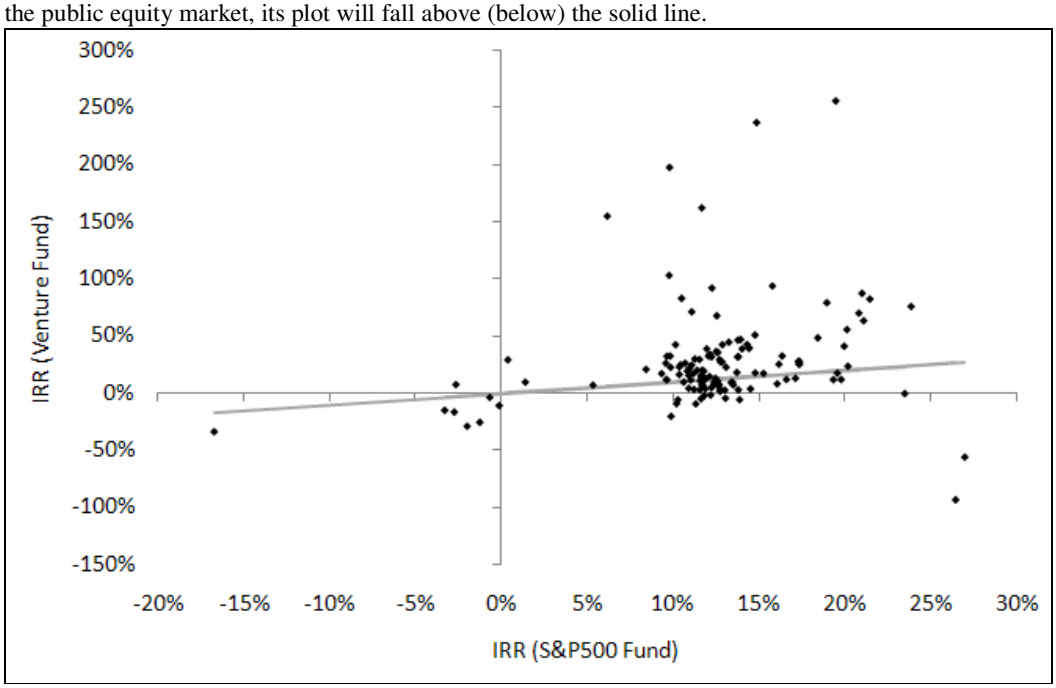


Figure IV
Quarterly IPO Market Data

The total number of IPOs, total number of venture backed IPOs and total number of venture backed IPOs that were unprofitable at the time of investment are plotted in the upper panel. The lower panel presents a plot of the percentage of venture backed IPOs that were unprofitable.

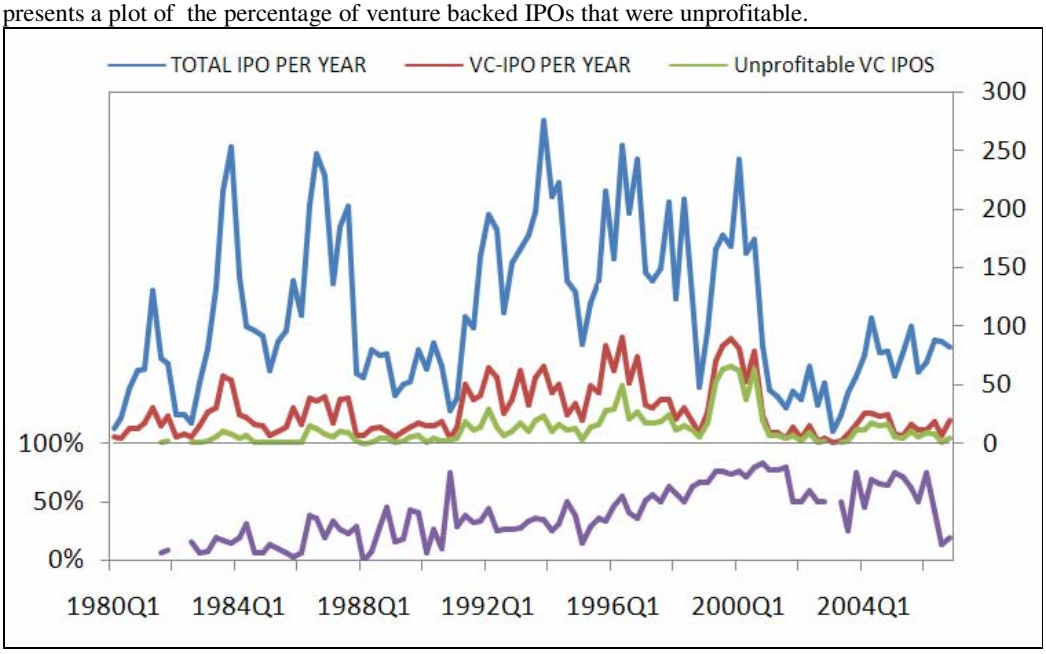


Figure V
Venture Fund IRR and Market Conditions

The following table presents a plot of the fund IRR relative to the market conditions parameter for each fund. The symbols are used to denote different vintage periods.

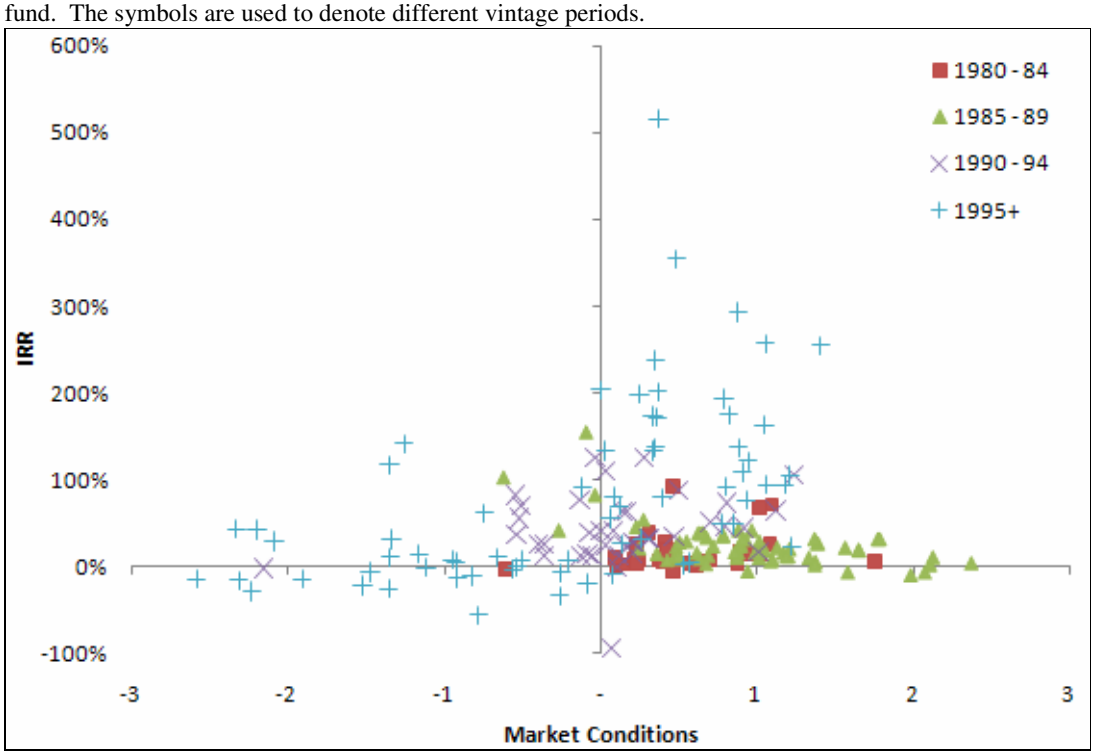


Figure VI
Venture Fund IRR and Investment Exit Conditions

The following table presents a plot of the venture fund IRR relative to the fund exit conditions. The symbols are used to denote different vintage periods.

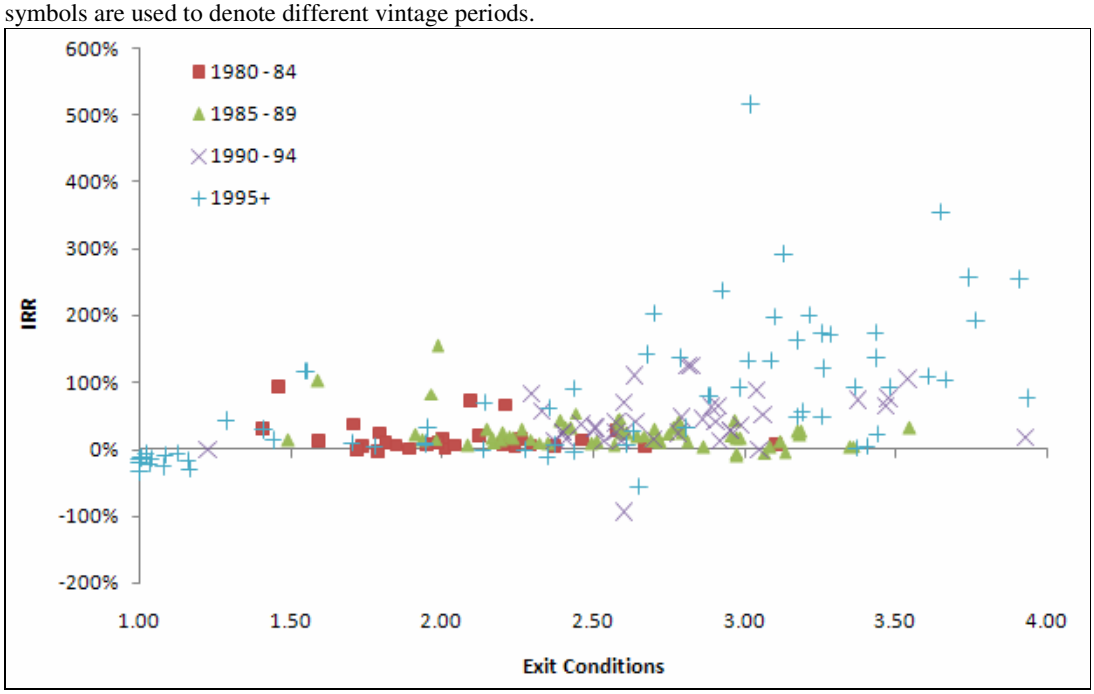
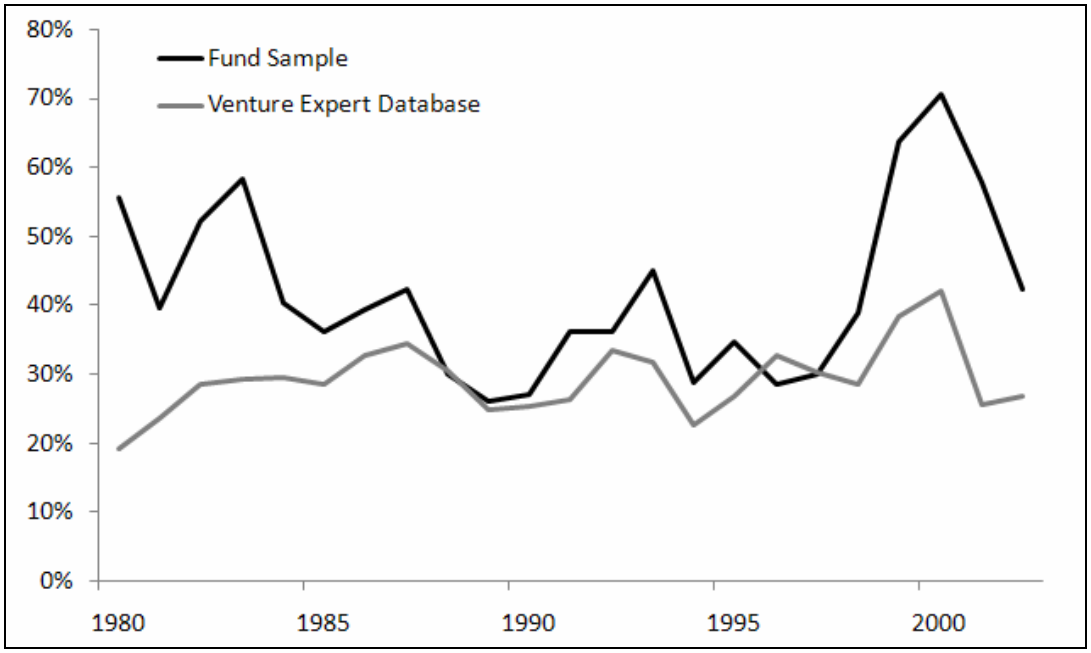


Figure VII
Intensity of Fund Takedown

This figure presents a plot of the intensity of the takedown process for each year in the sample period for the funds captured in the database. To provide a comparison to the industry, a similar metric is constructed for all funds captured in the Venture Economics database.



Appendix
Summary of IPO Data

The following table presents information as to the total number of IPOs, the total number of venture backed IPOs and the total number of venture backed IPOs that were unprofitable by quarter.

Quarter	Total IPOs	VC-Backed IPOs	Unprofitable VC-backed IPOS	Quarter	Total IPOs	VC-Backed IPOs	Unprofitable VC-backed IPOS
1980Q1	13	6		1990Q1	64	15	1
1980Q2	22	5		1990Q2	86	15	4
1980Q3	47	13		1990Q3	66	19	2
1980Q4	62	13		1990Q4	28	4	3
1981Q1	63	18		1991Q1	39	14	4
1981Q2	131	31		1991Q2	108	50	19
1981Q3	73	15	1	1991Q3	99	37	12
1981Q4	68	23	2	1991Q4	160	41	14
1982Q1	24	6		1992Q1	196	65	29
1982Q2	25	8		1992Q2	183	56	14
1982Q3	18	6	1	1992Q3	112	26	7
1982Q4	52	15	1	1992Q4	154	37	10
1983Q1	81	27	2	1993Q1	166	62	17
1983Q2	133	31	6	1993Q2	178	33	11
1983Q3	216	58	10	1993Q3	198	56	20
1983Q4	253	54	8	1993Q4	276	66	23
1984Q1	143	25	5	1994Q1	211	44	11
1984Q2	100	22	7	1994Q2	223	51	16
1984Q3	96	16	1	1994Q3	139	24	12
1984Q4	92	15	1	1994Q4	129	34	13
1985Q1	62	7	1	1995Q1	85	20	3
1985Q2	87	10	1	1995Q2	120	49	14
1985Q3	96	14	1	1995Q3	139	44	16
1985Q4	139	30	1	1995Q4	216	83	28
1986Q1	109	16	1	1996Q1	158	62	29
1986Q2	204	39	15	1996Q2	255	90	49
1986Q3	247	36	13	1996Q3	197	52	21
1986Q4	228	40	8	1996Q4	243	74	27
1987Q1	136	18	6	1997Q1	146	33	17
1987Q2	185	38	10	1997Q2	139	30	17
1987Q3	202	39	9	1997Q3	149	38	19
1987Q4	60	7	2	1997Q4	206	38	24
1988Q1	56	7	0	1998Q1	123	21	12
1988Q2	80	13	1	1998Q2	209	30	15
1988Q3	75	14	4	1998Q3	123	19	12
1988Q4	76	11	5	1998Q4	48	9	6
1989Q1	41	6	1	1999Q1	96	27	18
1989Q2	50	11	2	1999Q2	166	70	53
1989Q3	53	14	6	1999Q3	178	84	64
1989Q4	80	17	7	1999Q4	168	89	66

Appendix (Continued)

Quarter	Total IPOs	VC-Backed IPOs	Unprofitable VC-backed IPOS
2000Q1	243	81	62
2000Q2	162	53	38
2000Q3	174	79	63
2000Q4	84	24	20
2001Q1	46	9	7
2001Q2	40	9	7
2001Q3	31	5	4
2001Q4	45	14	7
2002Q1	37	4	2
2002Q2	66	15	9
2002Q3	33	2	1
2002Q4	52	4	2
2003Q1	10	1	-
2003Q2	24	2	1
2003Q3	44	8	2
2003Q4	57	16	12
2004Q1	75	26	12
2004Q2	107	26	18
2004Q3	78	23	15
2004Q4	79	25	16
2005Q1	57	8	6
2005Q2	78	7	5
2005Q3	100	16	10
2005Q4	61	12	6
2006Q1	69	12	9
2006Q2	88	19	8
2006Q3	87	7	1
2006Q4	82	20	4