

Assessing Venture Capital Returns for Efficient Investing in Nanotechnology

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ABSTRACT

The advent of nanotechnology and recent emergence of venture capital (“VC”) investing in early stage nanotechnology firms makes this a good time for a reexamination of VC investment successes and failures. In this article, Dr. Pearl Chin asks tough questions about venture funds that claim to successfully invest in nanotechnology and she provides an analytical assessment of ways to avoid the investment pitfalls of the dot com and biotech eras. Dr. Chin’s firm, Seraphima Ventures, is an investment fund based on the assertion that better management oversight tips the scales in favor of a successful fund.

A number of recent academic studies provide analyses of the returns to private equity that support this assertion. First, their findings show that private equity funds, both venture capital and buyout, generated roughly equal returns to public equity. Second, they show good venture capital management is a key factor for success. Third, studies show that large funds started in boon years performed most poorly because of a rush of capital flowing into funds designed to jump on the bandwagon.

Thus, private equity firms have not yet achieved their potential. If a traditional venture fund is considered successful with a 1 in 10 hit rate using a carpet-bombing approach; then a targeted fund that provides a management team with comparable deal selection abilities in terms of investment and technology expertise, would be expected to do at least as well. This investment management philosophy can improve performance outside of nanotechnology and for European investments as well.

INTRODUCTION

In the aftermath of the bursting of the dot com and biotech bubbles, it is increasingly important for investors to become more savvy about preventing the considerable investment losses sustained during those periods of technology investment. Nanotechnology is the next big thing in which to invest but investors are now much more cautious about technology investing. Technology still offers

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excellent opportunities for significant returns so it may be useful for investors and venture capital funds to learn from past mistakes.

Most nanotechnology venture funds are based on the familiar model that teams investment bankers on one side with scientific experts on the other. Although this combination enables easy identification of viable technology, viability itself does not guarantee success. After all, there are many viable technology companies out there without realistic hopes for a profitable exit.

Often in these deals, neither the bankers nor the technology experts involved have worked in a successful startup environment. Their lack of direct experience leaves them unable to advise the portfolio company properly on business strategy issues to achieve successful exits. The better VC firms recognize the need to include people with operations experience on both due diligence and portfolio management activities. Venture capital firms who have failed technology companies in their portfolio often will readily admit that the technology was good but the company's management failed. This can result even where the venture capital firm helps choose the appropriate management for their portfolio company. The question then becomes "what additional value should venture capital management be able to bring to the management table?"

Anyone interested in venture capital has heard mythical stories of VC investments that generated returns over a thousand percent. But comprehensive assessments of returns in venture capital remain a mystery to even the most interested investors. Limited Partners ("LPs"), who provide the monies invested by VCs, are among this group. LPs are typically institutional investors such as retirement funds, insurance companies, foundations, or investment firms just to name a few. Their money often comes from individual investors whose retirement or insurance monies are pooled together and invested by these institutional investors. These investments can amount to very large sums, in many cases in the billions of dollars. In order to justify the fees associated with managing these funds, institutional investors must offer superior returns or risk losing their funds. Often, these institutional investors invest in private equity in an attempt to achieve the necessary superior returns.

A closer examination of venture capital returns can help explain actual performance. However, real-time measures of prices, as for public equity or the stock markets, are not available for VC investments. It is especially difficult to value unrealized investments. There has been extensive academic data on this issue, which has been recently reviewed by Draho.¹² There all private equity funds were categorized into two groups; venture capital and buyout funds. In this article, the primary focus will be on venture capital. These studies have been able to help identify what factors may result in a successful venture capital fund.

The findings show that returns on private equity investments are not significantly superior to public equity investments. Furthermore, the findings demonstrate that the returns are not significantly better as widely believed. As a result of these findings, strategies are proposed to address those deficiencies. It is also important to keep in mind that, in these studies, there were also analyses demonstrating that the internal rates of return ("IRR") of investments are over-reported in some cases so a conservative mindset in accepting validity of the statistics is recommended.

I. KEY FINDINGS OF THE STUDIES

Draho summarizes several key findings from his review of the data. The first and most interesting finding was that private equity funds generated roughly equal returns to those of public equity. The second finding was that a follow-on fund was found to perform better if the previous fund was successful.

¹ Jason Draho, *The Returns to Private Equity* [hereinafter "*Returns*"], VC EXPERTS.COM, July 22, 2003; Jason Draho, *The Returns to Private Equity, An Update* [hereinafter "*Update*"], VC EXPERTS.COM, May 18, 2004.

² Draho, *Update*, *supra* note 1.

Similarly, past performance was an indicator of future poor performance. The third finding was that funds started in boon years with the heaviest capital inflows subsequently performed the worst. The fourth finding was that VC funds based either in Europe or invested exclusively in European countries performed far worse than U.S. similarly focused funds.³

Generating returns that were roughly equal to the returns to the public markets could be a reason not to invest in private equity. However, Draho asserts that assessing private equity as an asset class, based solely on the total returns generated, provides an incomplete picture because private equity can diversify portfolios if returns have low correlation with other assets. Draho notes that even if the returns to private equity are no better than those generated by public stocks, overall portfolio risk can be lowered without adversely effecting expected returns.⁴ This assertion has some validity since diversification in a portfolio spreads out the overall risk. Thus the adage, don't put all your eggs in one basket.

Ultimately, however, investors want return. Unless there is upside, why invest in private equity as an asset class? If there are less risky public equity investments with comparable return and greater liquidity, then investors should prefer those investments. Investors want to avoid risk but maximize returns and those who take risks expect to be rewarded for it. Fund managers have a fiduciary responsibility to meet demands for higher returns while also investing responsibly.

The second finding was follow-on funds were found to perform better if there was previous good performance and vice-versa. Draho concludes that this pattern implies that experience and demonstrated ability was a significant factor in predicting future performance. This is not surprising but contradicts the adage in public equity that past performance is not a predictor of future performance. Draho also points out there is a correlation between new funds with good performance started by successful firms and the flow of capital into these new funds. He asserts smaller sized funds force managers to be more selective in the quality of their investments. It is not quite clear what fund size range is considered within these limits but it is probably a general trend. This supports the proposition of using a very targeted approach by choosing a few good deals rather than a carpet-bombing approach.

However, this does not necessarily mean that investors should only invest in venture capital funds with proven return and management ability. If everyone invested in the same VC funds this would limit the pool of funds in which to invest and not allow proper risk diversification. Instead, new funds must be allowed to flourish along with a natural selection process of weeding out poorly performing funds. New funds with the hope for better returns can thus continuously replace underperforming funds. The question remains, "how do you figure out which ones those that are going to perform well?"

The third finding was that new large funds started in boon years performed the worst. Poor performance was attributed to too much money chasing too few good deals.⁵ Such funds were most likely created to take advantage of the flush of money as a result and exhibited herding effects. A herd mentality here is typified by attempts to copy an investment strategy of a successful fund without understanding how the management of the fund selects deals and instead results in more of a carpet-bomb approach for an investment strategy. Hence, it is expected that the first few successful nanotech exits will spark a whole slew of new nanotech VC funds attempting to ride the coattails of other funds' successes. Investors will want some way to jump on the bandwagon to exploit the boon even when they may have previously turned down the opportunity to invest in those same funds. So beware of new lemming or herd funds created in a boon year.

³ Draho, *Returns*, *supra* note 1; Draho, *Update*, *supra* note 1.

⁴ For a detailed discussion of the role of correlation between assets in diversification, see Appendix.

⁵ Paul Gompers & Josh Lerner, *Money Chasing Deals? The Impact of Fund Inflows on Private Equity Valuations*, 55 J. FINANCIAL ECON. 239 (2004).

Next we present some interesting observations from data that compares U.S. venture capital and European funds. As Seraphima Ventures is focusing on international investments, it is useful to present these conclusions since many of the first few nanotechnology funds have been created in Europe. Two studies examined VC returns in Europe and showed that VC funds either based in or focused on investing exclusively in European investments performed far worse than similar U.S. VC funds because of differences in management approaches.

II. SUPPORTING STUDIES, DATA, AND RESULTS

Draho summarizes the relevant data from these studies in his reviews and his findings are presented in this section.

Private equity funds differ in investment type, style, region, industry, and stage. Two separate studies examined venture capital returns using fund data supplied by Venture Economics. Steven Kaplan and Antoinette Schoar analyzed 580 venture capital funds started from 1980 to 1994. These have all realized relevant cash flows.⁶ The average annualized IRR for the funds was 17%. Charles Jones and Matthew Rhodes-Kropf analyzed the returns of 866 funds that were started between 1980 and 1999.⁷ IRR for this group was 19%. These funds have not been fully liquidated, potentially biasing the average IRR lower because of what happened with the dot com and biotech bubble bursting in these last few years. A study by Alexander Ljungqvist and Matthew Richardson reported IRRs for 19 funds started between 1981 and 1993. This was based on explicit cash flow data provided by an LP.⁸ IRR for this small sample was 14%. Roughly this appears to indicate that average IRR can be approximated at around 15%. By contrast, public equity returns, via S&P 500 or NASDAQ, were reported to be approximately 17%.

Kaplan and Schoar found that 25% of all funds had IRRs of 3% or less, while another 25% had IRRs in excess of 22%. This is interesting because this could indicate that the Pareto Principle of the 80/20 Rule may apply in terms of 20% of the funds making 80% of the returns. However, the analysis to confirm this hypothesis has not been done, even though the data is already available from the studies.⁹

Patterns of returns were also analyzed for VC funds specializing in seed, startup, later stage and mezzanine financing. Sanjiv Das, Murali Jagannathan and Atulya Sarin examined data on over 52,000 early, expansion and late stage financing rounds from 1980-2000 supplied by VentureXpert. Values at the time of financing were compared to the value at an IPO or acquisition exit and financing rounds without a successful exit were assumed to be worthless. They estimated that an average exit of 4 years of an early stage investment yielded an annual return of about 50%. A three-year exit from expansion stage yielded a 26% return and a one-year exit from a late stage investment yielded a 12% expected return.¹⁰

Oliver Gottschalg, Ludovic Phalippou and Maurizio Zollo reported that funds that made fewer investments, invested in only a single type of deal or a single industry strongly outperformed.¹¹ Along those same lines, Cumming and Walz found that the number of portfolio companies per VC manager was negatively related to the realized IRRs. One obvious interpretation is that the ability of the VC to provide

⁶ STEVE KAPLAN & ANTOINETTE SCHOAR, PRIVATE EQUITY PERFORMANCE: RETURNS, PERSISTENCE AND CAPITAL FLOWS (University of Chicago Graduate School of Business Working Paper, 1983).

⁷ CHARLES JONES & MATTHEW RHODES-KROPF, THE PRICE OF DIVERSIFIABLE RISK IN VENTURE CAPITAL AND PRIVATE EQUITY (Columbia University Graduate School of Business Working Paper, 2003).

⁸ ALEXANDER LJUNGQVIST & MATTHEW RICHARDSON, THE CASH FLOW, RETURN AND RISK CHARACTERISTICS OF PRIVATE EQUITY (NBER working paper 9454, 2003).

⁹ Kaplan & Schoar, *supra* note 6.

¹⁰ SANJIV DAS, MURALI JAGANNATHAN & ATULYA SARIN, THE PRIVATE EQUITY DISCOUNT: AN EMPIRICAL EXAMINATION OF THE EXIT OF VENTURE BACKED COMPANIES (Santa Clara University Working Paper, 2002).

¹¹ OLIVER GOTTSCH LUDOVIC PHALIPPOU & MAURIZIO ZOLLO, PERFORMANCE OF PRIVATE EQUITY FUNDS: ANOTHER PUZZLE? (INSEAD Working Paper, 2003).

valuable advice to the entrepreneurs is constrained when their attention is spread too thin. Value may be better created through more intensive monitoring of fewer investments.¹² This effect was not seen to be as pronounced in later stage investments, which is consistent with the claim that most value is created at the earliest stages. Syndicated investments and the use of convertible securities were associated with significantly higher IRRs.

The higher returns to the funds of established partnerships reflect consistently good performance. Kaplan and Schoar documented that partnerships that had a successful fund were more likely to have success with a new fund. Partnerships with low rates of return could also be expected to perform poorly in the future. In particular, they estimated that a 1 percentage point increase in the current fund IRR was associated with a 54 basis point higher IRR in a subsequent fund.

The flow of capital into new funds also supports interesting observations on the returns to private equity. Portfolio company values are correlated with the amount of money flowing into funds. Paul Gompers and Josh Lerner estimated that a doubling of the amount of capital inflows into funds was related to between a 7% and 21% increase in the value of portfolio companies.¹³ This lowers the returns to private equity by about 15%, assuming an unchanged exit value.

Ljungqvist and Richardson similarly found that the more money raised by all funds in a given year, the worse their subsequent performance.¹⁴ Kaplan and Schoar found that funds and partnerships were more likely to be started when the industry performed well. However, these partnerships were less likely to raise a follow-on fund, suggesting that these funds had performed very poorly. The increase of capital flowing into private equity during these flush markets did not go to top performing funds, but went instead to new funds that produced poor returns.¹⁵

Kaplan and Schoar found that in fact this decline in performance was due primarily to the proliferation of new funds during boon years. They reported that older VC funds were largely unaffected by the number of new funds started in a given year, but the returns to new funds were adversely impacted. The study shows that the flow of capital into new funds started by new partnerships was highly cyclical. This suggests that such funds were created to take advantage of economic highs and the associated flush of money. Herding effects appeared when it was perceived that there was easy money to be made. Thus investors should beware of new funds created in boon years that profess similar industry and management approaches as a successful fund they are imitating.

Gottschalg, Phalippou and Zollo also demonstrated that VC funds that invested during an economic boon significantly underperformed. This was attributed to venture deals becoming too expensive. However, VC funds that invested during periods of unexpectedly high GDP growth outperformed. Stock market fluctuations had relatively little effect on VC funds.¹⁶

Douglas Cumming and Uwe Walz examined VC returns in 39 countries and found that the realized IRRs were directly and significantly related to the soundness of the legal conditions in a country, proxied by a legality index.¹⁷ Most of the estimates for the returns to private equity are based on the performance of U.S. funds because the U.S. private equity market was far more developed than its European

¹² See generally, DOUGLAS CUMMING & UWE WALZ, PRIVATE EQUITY RETURNS AND DISCLOSURE AROUND THE WORLD (University of Alberta Working Paper, 2004).

¹³ Gompers & Lerner, *supra* note 5.

¹⁴ Ljungqvist & Richardson, *supra* note 8.

¹⁵ Kaplan and Schoar, *supra* note 6.

¹⁶ Gottschalg, et al., *supra* note 11.

¹⁷ Douglas Cumming and Uwe Walz examined the returns from 221 VC and private equity funds, spanning 32 years (1971-2003) and 39 countries. The data is from the Center for Private Equity Research (“CEPRES”) in Frankfurt, Germany.

counterparts throughout the 1980s and 1990s.¹⁸ Gottschalg, Phalippou and Zollo found that exclusive European funds returned about half as much as U.S.-invested funds.¹⁹ Ulrich Hege, Frederic Palomino and Armin Schweinbacher examined funds in Belgium, Germany, Sweden, France, the Netherlands and the UK. They too found a significant gap in performance between U.S. and European firms, both in terms of type of exit and rates of return.²⁰

The latter study examined some of the specific differences in return patterns to U.S. and European funds and proposed explanations for their divergence. The total length of an investment was strongly inversely proportional to the corresponding return in the U.S., but was almost directly proportional in Europe. The same pattern held for the average duration between financing rounds. Thus U.S. investments were shown to have shorter exit times than comparable European investments.

Furthermore, portfolio firms that received a larger percentage of their total VC financing in the first round produced better returns.²¹ These patterns were attributed to U.S. VCs doing better jobs of screening out good projects initially and pushing them to a successful exit event sooner.

The gap in performance could be attributed to differences in contractual relationships between VCs and entrepreneurs. VCs in the U.S. were much more assertive in demanding financial contracts—usually convertible securities—that transferred residual control rights to them in case of poor performance. They also exercised control more frequently, as measured by the replacement of entrepreneurs and the termination of projects. There was a direct correlation between the control exercised by VCs and the success of their investments.

Draho asserts that it appears European VCs function more as dealmakers than active monitors. They seem to lag in their ability to select projects and provide fewer value-add services to portfolio companies.

Assessing private equity returns is still fraught with difficulty due to lack of data since VCs are private firms with no obligation to divulge confidential information. This leads to problems using IRR as a measure of returns, and valuing unrealized or unexited investments. Ideally, the estimates should monitor cash flows into and out of a fund while taking into account the time value of money and the level of fund risk. These cash flows would take into account the takedowns of committed capital at the start as well as the disbursements after an exit event. Some of the returns reported in the subsequent studies are based on the cash flows received by the limited partners, net of the management fees and carried interest. The returns measure the actual payoff to limited partners, net of management fees and carried interest, which they would most care about, and not the total return generated from private investments. However, these are still not the most ideal measures of return on private equity.

1. Basic Finance Assessment: Alphas, Betas and Risk²²

Alphas, from a mutual fund perspective, measure the excess return a fund manager can generate in addition to the expected market return for a certain level of beta or risk. Thus, if alpha is statistically zero,

¹⁸ John Hand used data from 154 U.S. biotechnology companies that went public over the period 1992-2003. *See generally* JOHN HAND, DETERMINANTS OF THE RETURNS TO VENTURE CAPITAL INVESTMENTS (University of North Carolina Working Paper, 2004).

¹⁹ Oliver Gottschalg, Ludovic Phalippou and Maurizio Zollo used PE fund data from Venture Economics and VentureXpert. It covered funds raised from 1980 to 2002.

²⁰ Ulrich Hege, Frederic Palomino and Armin Schweinbacher used data constructed from the VentureXpert database provided by Venture Economics. They had a total of 147 firms in the European sample and 234 firms in the US sample. *See generally* ULRICH HEGE, FREDERIC PALOMINO & ARMIN SCHWEINBACHER, DETERMINANTS OF VENTURE CAPITAL PERFORMANCE: EUROPE AND THE UNITED STATES (LSE working paper No. 001, 2003).

²¹ Frank Kerins and Richard Smith used firms from eight technology-oriented industries that went public during 1995 to 2000, resulting in 2,623 firm-year observations. *See generally* Frank Kerins, Janet Kilholm Smith & RICHARD SMITH, OPPORTUNITY COST OF CAPITAL FOR VENTURE CAPITAL INVESTORS AND ENTREPRENEURS (Claremont University Working Paper, 2003).

²² For a review of the finance principles underlying this discussion of alpha and beta factors, see Appendix.

it means the fund manager has brought little added value to the fund and performance based on market factors. After making adjustments for higher risk or betas, studies have found that *overall fund alphas were not statistically different from zero*. This means LP returns were not statistically different from those generated by public equity markets. This result should be distressing to venture capital investors because it means the risk they bear for returns does not justify related management fees.

Beta is used as a measure of an asset's effect on the overall portfolio's risk and return. The risk in investing in a large market like the New York Stock Exchange is a beta of 1. A firm's beta is thus measured in comparison to the risk of the overall market. If the company has a beta of 3.0, then it is said to be 3 times more risky than the overall market. (*beta > 1 individual risk greater than market risk, beta = 1 individual risk equals market risk, beta < 1 individual risk less than market risk*). Estimating a beta for private equity investments is difficult because real-time market values cannot be tracked like public equity (e.g. stock market) as is done via share prices.

In spite of this problem, however, some researchers have tried to assign private equity betas. In these studies, betas for private equity were assessed in a very subjective manner by "marking-to-market." However, it is unclear how valid the comparisons are in these studies since public equity betas are based on actual market prices while betas for private equity are determined differently based on assumptions of the value of the unrealized investments. Thus the conclusions from comparisons may not be valid and so those discussions are not presented here. Those arguments compare these betas to corroborate the conclusions supported earlier by the better method of comparing IRR using actual cash flow and returns.

However, there is more validity in comparing betas within the asset class of private or public equity for the same reasons. Betas within the private equity asset class can be compared because they are measured the same way. Using betas as such, Gottschalg, Phalippou and Zollo found that idiosyncratic risk²³ is priced in the returns and that funds that focused their investments in a particular industry or investment type had better returns.²⁴ In other words, focusing on a particular sector or sectors of deep expertise can maximize returns. Of course, this increases risk, but also potential reward, because the portfolio is implementing a lower diversification strategy and because risk and return are directly related.

2. Past Performance is Indicative of Future Performance; But What If There is No Past Performance?

The data supports the LP belief that the most important criteria for selecting funds are its reputation and the skill of its general partner. Proven funds and their general partners attract better access to superior investments and more favorable financing terms due to reputation. The data also supports the conclusion that ability and skill of a VC to add value to portfolio companies directly corresponds to higher returns. The ability of VCs to advise entrepreneurs properly is diluted when attention is spread too thin over too many investments. Thus, studies support the argument that VCs create value through better management and control in early stages. Besides the use of convertible securities, resulting in more contingent control by VCs, being associated with significantly better returns, what cannot be derived from the studies is whether or not the type of management and advice by VCs made a difference.²⁵

Demonstrated management ability is easier to identify because one only needs to look at successful funds to find them. Not all unproven management ability will result in failed funds. However, unproven ability, in general, is more difficult to assess. Unproven ability is as valuable if recognized early on and

²³ Idiosyncratic risk is unsystematic risk or risk that is uncorrelated to the overall market risk or in other words, the risk that is firm-specific and can be diversified through holding a portfolio of stocks. This is also about not putting all your eggs in one basket. Systematic risk is called undiversifiable risk or market risk. Systematic risk refers to risk factors common to the entire economy. For example, the impact of going to war in Iraq affects systematic risk. Whereas idiosyncratic risk can be eliminated by diversification, systematic risk cannot.

²⁴ GOTTSCHALG, PHALIPPOU & ZOLLO, *supra* note 11.

²⁵ *See generally*, CUMMING & WALZ, *supra* note 12.

often more valuable as they offer better deal terms to investors for the opportunity to prove themselves. This is not that different from being able to recognize values of deals that are not as obvious to other investors. After the fact, proven management will likely demand a premium for their services.

How does an investor assess management expertise? How is it measured in lieu of proven experience? How important is technical expertise? How can technical expertise be measured? It is important to remember that subsequent or follow-on funds are those following successful funds, not those following funds without successful exits. Does coming from a successful fund mean that a manager was a good manager of companies? Or must each person be assessed individually? Perhaps the following illustration may be helpful to elucidate the purpose and value of management:

Four workers can make 6 units in an eight-hour shift without a manager. If I hire you to manage them and they still make 6 units a day, what is the benefit to my business of having hired you? On the other hand, if they now make 8 units per day, you, the manager, have value.²⁶

This is an illustration of the alpha measurement and why it is important. It is evident that if the firm subsequently makes 4 units a day there is a problem with its manager. The analogy applies to service, retail, teaching, or other kinds of work. Can your group handle more customer calls with you as a manager? Sell higher value merchandise? Impart knowledge more effectively? That is the value of management—making a group of individuals more effective. Hence, the question of whether a venture capital fund returns more value than the industry average, including public equity markets.

3. New Bandwagon Funds

It is important to point out that new capital inflows do not cause cycles but are caused by cycles. Capital inflows are thus out of phase and lag behind the economic cycles. Once the economic highs start to decline, which may be due to poor performance of these poorly performing funds, the creation of new funds, and thus in turn the new capital inflows, slows down and bottoms out, causing the cyclical behavior in the capital flows into new funds. However, the measure of capital flowing into funds, as a result of funds being created, is an interesting indication and can possibly a predictor of the types of funds created during a period if the phase angle or lag time is known ahead of time. In other words, if the behavior patterns of the capital inflows into new funds and the economic cycles were understood well enough, it would help an investor optimize investment strategy on how and when to invest in new funds during both economic highs and lows.

From Paul Gompers and Josh Lerner's study²⁷ where a doubling of the amount of capital into a fund only corresponded to a 7%-21% increase in portfolio company valuation, it seems there is too much money chasing too few good deals and that the marginal return on the investment decreases significantly as the investments become more expensive. The rule is to buy low and sell high, not the other way around. It also indicates that after a certain point, money itself will not guarantee successful exits and that the effect and contribution of management at that point becomes a greater factor in achieving successful exits. Such is the Law of Diminishing Returns where, as the input of one factor rises holding other factors fixed; the marginal return product of that factor must eventually decline.

Kaplan and Schoar showed that new funds were more likely to be started in boon times and a decline in industry performance was a result of badly performing new funds created during a boon year.²⁸ Ljungqvist and Richardson's data suggest that significant increases in monies raised by all funds overall in a period are indicative of the beginning of such a boon year. This significantly contributes to these

²⁶ See F. John Reh, *Management 101, Your Guide to Management*, available at <http://management.about.com/cs/generalmanagement/a/Management101.htm> (last visited Feb. 22, 2005).

²⁷ Gompers & Lerner, *supra* note 5.

²⁸ Kaplan & Schoar, *supra* note 6.

additional monies.²⁹ This suggests that such funds are most likely created to take advantage of economic highs and the flush of money and herding effects. When it is perceived that there is easy money to be made, new VC's appear to ride the wave. Perhaps also there is less scrutiny on investments made when money is cheap. Thus investors should beware of new funds created in boon years that profess similar industry and management approaches as a successful fund they are imitating.

Investing during an economic boon was shown to result in significant underperformance and was attributed to deals becoming too expensive or overvalued by hype. The private and public equity industry has become familiar with this phenomenon as a result of being burned by dot com and biotech investments. Stock market fluctuations have relatively little effect on VC funds so it is not surprising that private portfolio company valuations have little to do with short-term public sentiment and current markets as these investments are viewed as meeting long-term market needs. In other words, performance here is more dependent on how well the VC firm can predict the needs of the future.

III. NOW FOR EUROPE

It is interesting that the data indicates U.S. investments have shorter exit times and produce better returns than European investments. U.S. firms receive larger percentages of total financing in early rounds and U.S. VCs more effectively manage quick exits.³⁰ However, this may also be due to the fact that more money in the beginning allows startups to build better and more stable foundations from which to grow. This is consistent with the claim that most value is created in the early stages.

The view that European VCs are more dealmakers than managers supports the idea that appropriate VC management could create added value in European deals just as in U.S. deals. There is no evidence that the quality of deals in Europe is worse than U.S. deals. That being the case, it is easy to imagine the opportunities for U.S. style investments and management approaches that can create similar value in Europe to what has been accomplished in the U.S. This is one of the most exciting aspects of the Seraphima approach.

IV. CONCLUSION

Of great interest is the fact that these studies conclude that the overall returns on private equity are not substantially different from public equity. Private equity can still satisfy a need to diversify portfolios. However, private equity would not satisfy the needs of many small investors, whose 401K and other retirement plan monies are being managed by LPs that invest in such vehicles as venture capital. They will demand a better management of the return for the risk being taken on investing their retirement monies. An investment manager that does not offer higher return for higher risk to his/her investors will likely not stay in that position for long.

There are many instances of venture capital deals achieving fantastic returns. This indicates that the private equity firms have not yet achieved their potential and there is much room for improvement and those new approaches in venture capital investing should be considered more seriously. Change can be a good thing, but it will likely be scary for many who prefer to continue in the current methods because they have become accustomed to poor performance as the norm. However, this becomes a problem if even a few investors take the chance on a different investment approach. Perhaps a contrary approach

²⁹ Ljungqvist & Richardson, *supra* note 4.

³⁰ Frank Kerins and Richard Smith used firms from eight technology-oriented industries that went public during 1995 to 2000, resulting in 2,623 firm-year observations. *See generally* Frank Kerins, Janet Kilholm Smith & RICHARD SMITH, OPPORTUNITY COST OF CAPITAL FOR VENTURE CAPITAL INVESTORS AND ENTREPRENEURS (Claremont University Working Paper, 2003).

rewarded with returns appropriate for the risks will result in finger pointing at investment managers who ignored value found by others.

This is an indication that investors should change their decision process on how to choose venture capital funds. Inevitably, new funds must be created to broaden the investment offerings so that institutional investors will have somewhere to invest their funds. The challenge is how to assess their potential. Venture funds that are not in the top 20% will potentially weed themselves out, as investors will not help them raise follow-on funds. This will significantly limit the number of venture funds necessary for LP investors to properly diversify their portfolio.

The conclusions drawn from these independent studies of the returns to private equity, in particular venture capital, indicate that it is important to pay attention to assessing management potential, aside from just searching for fund managers with previous good track record to ensure a fund's success. The chances of a good management team member for a successful fund leaving to start a new fund is slim, as they often have equity stake in those prior funds that require their continued participation. However, the upside is those types of managers are not the only game in town. The downside and the risk is how to figure out who is the real deal. However, how these potential abilities are currently being assessed without demonstrated ability or track record is limited in scope. There must be greater effort to improve understanding and the assessment of value of management. It is important to remember that good information and appropriate use of information mitigates risk.

If a traditional VC fund is considered successful based on a 1 in 10 hit rate using a carpet-bombing approach to deal selection; then, a new VC fund that comes along offering a management team with a good deal selection abilities in terms of investment and technology experts, would be expected to do at least as well. If, in addition, the new fund also offers credible management capability for each company invested, this can only increase the probability of success.

These studies support Seraphima Ventures' business model that asserts that management is a major factor determining fund performance and success. Potential investors may wish to take a closer look at new venture capital funds with teams that profess to offer explicitly superior management capability, such as Seraphima Ventures. Potential investors may have already figured out on their own, without the studies, the value of such added management capability. Expectations to extend that investment management philosophy can only improve performance for European investments as well.

Management is both art and science. The art is making people more effective than they would otherwise be. The science is in how to do that. A manager's most important, and most difficult job is to manage people. A manager must lead, motivate, inspire, and encourage people. And sometimes managers must hire, fire, discipline and evaluate employees. It is important, then, for investors to increase their understanding of management and its overall value.

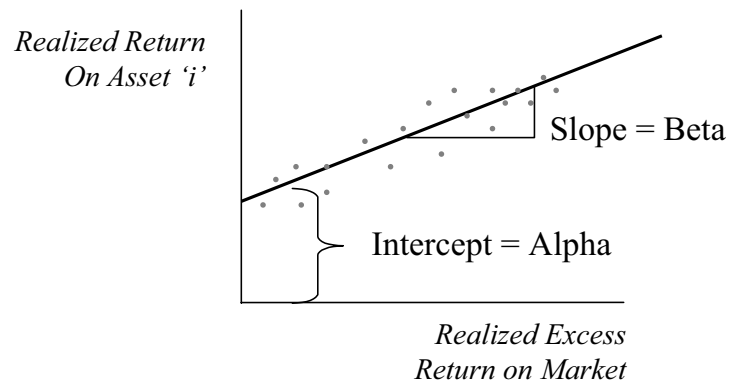
Hence the ability and skill of a VC to understand results, management and market dynamics and to create individual investment strategies could translate into significantly higher returns than are realized in public equity markets. Investors should thus do their due diligence by profiling the capability of the management team members of any fund.

A key takeaway is that these conclusions apply to any industry where venture capital investment internationally is possible, not only to nanotechnology. However, it would be best to implement these strategies now to optimize returns investing in nanotechnology and to avoid a nanotechnology bubble.

APPENDIX – ALPHAS AND BETAS EXPLAINED

As depicted in Figure 1, if you plot realized excess returns of an asset versus the realized excess return on the market, the alpha is intercept, which is the difference between the expected excess return on the security and the actual return, and beta is the slope. The asset's *characteristic line* is the line of the best fit for the scatter plot that represents simultaneous excess returns on the asset and on the market. The *alpha* is the intercept in the regression. Thus, here the alpha measures *risk-adjusted performance* of a security and is the difference between actual performance and expected performance.

FIGURE 1: RELATIONSHIP BETWEEN RETURNS, ALPHAS, AND BETAS



It is important to point out that this is not the CAPM equation. This is a regression that allows us to estimate the stock's *beta* coefficient. CAPM looks at risk and rates of return and compares them to the overall stock market. This is why CAPM is called the Capital Asset Pricing Model.

What makes the CAPM different from the statistical model is that the CAPM imposes the constraint that the intercept or *alpha* is zero. In the CAPM equilibrium, alphas will be zero unless a manager has superior information.

If the company has a beta of 3.0, then it is said to be 3 times more risky than the overall market.

$$K_s = K_{rf} + B (K_m - K_{rf})$$

K_s = The Required Rate of Return, (or just the rate of return).

K_{rf} = The Risk Free Rate (the rate of return on a "risk free investment", like U.S. Government Treasury Bonds)

B = Beta (see above)

K_m = The expected return on the overall stock market. (You have to guess what rate of return you think the overall stock market will produce.)

As an example, let's assume that the risk free rate is 5%, and the overall stock market will produce a rate of return of 12.5% next year. You see that XYZ Company has a beta of 1.7.

If you use CAPM you have to assume that most investors want to avoid risk, (risk averse), and those who do take risks, expect to be rewarded. So not only does CAPM help with assessing the reasonableness of asset pricing, it is also a tool for portfolio risk management. What rate of return should you get from this company in order to be rewarded for the risk you are taking?

For instance, investing in XYZ Company (beta = 1.7) is more risky than investing in the overall stock market (beta = 1.0), so you want to get more than 12.5%.

$$K_s = K_{rf} + B (K_m - K_{rf})$$

$$K_s = 5\% + 1.7 (12.5\% - 5\%)$$

$$K_s = 5\% + 1.7 (7.5\%)$$

$$K_s = 5\% + 12.75\%$$

$$K_s = 17.75\%$$

So, if you invest in XYZ Company, you should get at least 17.75% return from your investment. If you don't think that XYZ Company will produce those kinds of returns for you, then you would probably consider investing in a different stock.

Superior performance in the CAPM world is measured by “alpha”, which is the incremental expected return resulting from managerial information (e.g. stock selection or market timing). This can be represented formally as:

$$(1) \quad \begin{aligned} \alpha_p &= E[r_p | M] - E[r_p] \\ &= E[r_p | M] - \beta_p (E[r_{mkt}] - r_f) - r_f \end{aligned}$$

where $E[r_p | M]$ is the conditional expected return to the portfolio given the information M used by manager.³¹ In the CAPM equilibrium, alphas will be zero unless a manager has superior information. A portfolio with positive alpha offers an expected return in excess of its equilibrium risk-adjusted level and in this sense has superior performance.³²

Beta is the covariance between a security's return and the market return divided by the variance of the market return. The beta represents the risk of security in the market portfolio—or the contribution of security i to the variance of the market portfolio. The beta risk is the only type of risk that is rewarded or priced in equilibrium.

³¹ Measuring conditional expectations when managerial information is not directly observed is an important econometric challenge. Early CAPM-based studies (e.g. Jensen [1969]) regressed portfolio excess return on market excess return. The constant term was interpreted as the alpha in our equation (3), and the slope coefficient as beta in our equation (1). Roll [1978] indicates the unreliability of alpha measures when the market portfolio proxy is not mean-variance efficient. Further difficulties in using alpha as a performance measure when managers are able to successfully time the market are discussed by Dybvig and Ross [1984]; their results are closely related to the negative state prices observed in the CAPM by Dybvig and Ingersoll [1982]. Grinblatt and Titman [1989] propose to solve the problem by using positive period-weighting measures (i.e. state price densities), although their later empirical study (Grinblatt and Titman [1994]) suggests this makes little difference for evaluating mutual fund portfolios. Ferson and Schadt [1996], while retaining the CAPM framework, argue that beta should be estimated conditionally on a vector of relevant publicly available information variables, which may change through the sample period.

³² A related but not identical performance measure is the Sharpe ratio (SR) of a portfolio p , where

$$SR_p = \frac{E[r_p | M] - r_f}{\sigma_p}$$

The Sharpe ratio provides an appropriate measure of investor welfare when the investor has mean-variance preference and invests in the portfolio (and perhaps a risk-free asset) *exclusively*. Alpha, on the other hand, is a measure of performance when the portfolio is a small part of the investor's entire (fully-diversified) portfolio of assets. A portfolio with a Sharpe ratio greater than the market's will have a positive alpha, but the converse does not necessarily hold.

While there have been some notable recent advances in the theory of performance measurement, most practice is still firmly rooted in the approach of the Capital Asset Pricing Model (CAPM).³³ In the CAPM world, the appropriate measure of risk of any asset or portfolio p is given by its “beta”:

$$(2) \quad \beta_p = \frac{\text{Cov}[r_p, r_{mkt}]}{\text{Cov}[r_{mkt}, r_{mkt}]} = \frac{\text{Cov}[r_p, r_{mkt}]}{\text{Var}[r_{mkt}]}$$

where r_p and r_{mkt} are the random returns on the portfolio p and on the market, respectively, and r_f is the risk-free rate of interest. In equilibrium, all assets and portfolios will have the same return after adjustment for risk, implying:

$$(3) \quad E[r_p] = r_f + \beta_p (E[r_{mkt}] - r_f)$$

³³ Sharpe, Alexander, and Bailey [1995] provide a good overview of current practice in Chapter 25. Grinblatt and Titman [1989] review some key issues and provide extensions of traditional alpha measurement. Glosten and Jagannathan [1994] provide an elegant and general framework. But applications of their approach required assumptions similar to our framework below (lognormal index returns and Black-Scholes option pricing), while requiring greater complexity of implementation.