

## Article

# Biotech Venture Capital Investments in Public Equities and Performance

**Hans Jeppsson**

is the founder and managing partner of BioValuation Advisors, a research-driven boutique advisory firm specialized in asset valuation in the life sciences industry. Hans is also an Assistant Professor at the Department of Business Administration at the University of Gothenburg, Sweden. He was previously a biotechnology analyst at Danske Bank and prior to that held several positions within preclinical R&D at AstraZeneca.

## ABSTRACT

This study examines a large sample of venture investments in public equities (VIPEs) in the biotechnology and pharmaceutical industry over the period 1995-2014. The results of the study are threefold. First, and contrary to widely held beliefs, there has been no significant increase in the number of VIPEs over time. In fact, both in terms of dollar amount as well as the number of VIPE transactions have actually went down post the record year in 2009. Second, this study documents that returns profiles from the public venture capital market share many similarities to the returns in the private VC market: few big winners, but overall a high loss rate. Approximately seven investments out of ten in public firms generate a loss. Third, the analysis of private investments in public equities shows that venture capitalists outperform other competitors, such as hedge funds and mutual funds. From a management perspective, venture investments in public equity provide several benefits including providing an additional source of potential funding, aligning the investment horizon of venture capitalists with other long-term investors, certifying the quality of the firm and contributing to the long-term success.

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## INTRODUCTION

**V**ENTURE CAPITALISTS (VC) are best known for playing a key role as active investors and contributing with value-added activities in the professionalization of startup firms: VCs sit on the boards of directors, provide staged financing, participate in strategic decisions, and hire key managers to their portfolio firms.<sup>1</sup> The active role of VCs in privately held firms has been shown to contribute to better stock price performance in the long run after they go public.<sup>2</sup>

The aggregate performance of venture capital funds has, however, varied widely over time. While venture capital funds outperformed public equities in the 1990s by a wide margin, they underperformed in the 2000s<sup>3</sup> thanks in part to the IPO drought and lack of lucrative exits in the years following the dot-com (and genomics) bubble and more recently the financial crisis in 2008. Due

to the longer time to exits and fewer potential co-investors, several VC firms have been switching their interest away from investing in seed and early-stage startups toward more mature later-stage private companies.<sup>4</sup> As part of this shift in strategy, VCs have established specific investment vehicles to make investments in already publicly listed companies, known as venture investments in public equities (VIPE), to tap into opportunities what are perceived as bargain opportunities - undervalued public companies.

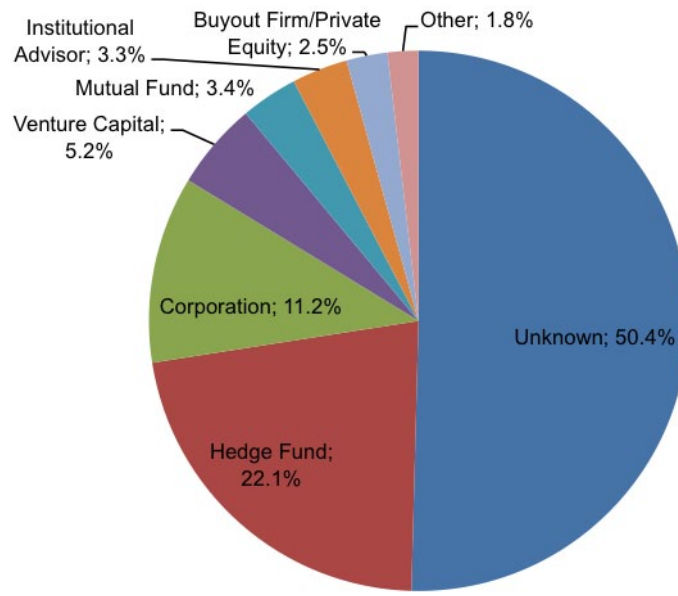
Anecdotal evidence points to some really successful investments. Abingworth's investment in Algeta in February 2009 (24x deal return)<sup>5</sup>, New Enterprise Associates' 2009-placement in Inhibitex (2,424% 5-year return), New Enterprise Associates' and Venrock's 2011-placement in Acadia Pharmaceuticals (2,381% 5-year return), Domain Associates' March-1999 venture investment in Amylin Pharmaceuticals (3,064% 5-year return), Longitude Capital's investment in Jazz Pharmaceuticals in July 2009 (4,031% 5-year return). Others argue that returns to VC life science specialists from investments in public equities have been very poor so far.<sup>6</sup>

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Correspondence:

Hans Jeppsson, University of Gothenburg, Sweden.

Email: hans.jeppsson@handels.gu.se



**Figure 1:** Investments by investor type in the pharmaceutical and biotechnology sector  
 This pie chart displays the fraction of PIPE investments by investor type in the pharmaceutical and biotechnology sector. The data is based on 4,076 (\$65.2 billion) PIPE deals over the period 1995-2014. Data is compiled from Sagient Research's database PlacementTracker.

To examine the performance of VIPES, and to shed some light on trends, contracting terms and motivations for VIPES, this study uses a large sample of VIPES in the biotechnology and pharmaceutical industry over the period 1995-2014.

corrections, as described in Supplemental Appendix 1, there are a total of 468 deals carried out by 302 firms with a total dollar amount raised of \$2,767 million.

## PIPE MARKET

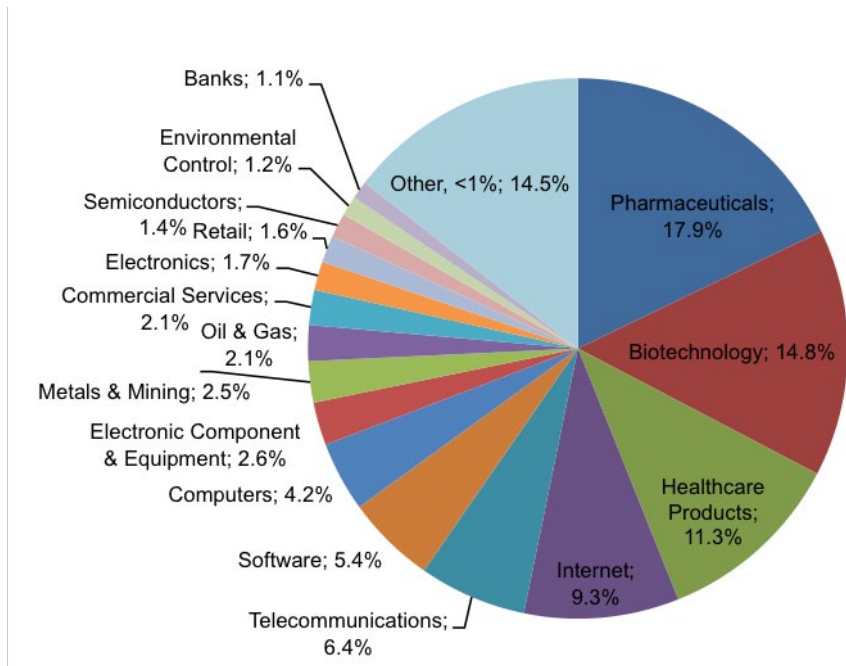
According to Sagient Research, which collects data on private investments in public equity (PIPE), a total of 4,076 PIPE transactions in the biotechnology and pharmaceutical industry, with a total dollar amount of \$65.2 billion, took place from 1995 to 2014. Sagient Research also classifies investments, where applicable, per investor type (see Figure 1). Hedge funds are the largest investor (22.1 percent) in the biotechnology and pharmaceutical sectors followed by corporations (11.2 percent), venture capital funds (5.2 percent) and mutual funds (3.4 percent).

While the capital contribution from venture investors is relatively small in comparison to hedge funds, the biotechnology and pharmaceutical sectors comprise the two largest industry sectors receiving venture investments in public equities in terms of number of deals (see Figure 2). In total, 1,865 deals (\$115.8 billion) involved venture capital investments across all sectors. Of these deals, 333 (17.9%) and 276 (14.8%) were within the pharmaceuticals and biotechnology sectors, respectively. After

## BIOTECH VENTURE INVESTMENTS IN PRIVATE VS. PUBLIC COMPANIES

There is a general consensus that venture investments in public equities have increased over time. Figure 3 and Table 1 display venture investments in public equities over the period 1995 to 2014. To put VC investments in public equity into perspective, I also compare biotech and pharmaceutical VC investments in public equity as percent of total VC investment in private (from NVCA using the biotechnology category) and public equity as well as percent of total PIPE investments (across all sectors).

In absolute terms, biotech venture investments in public equities have averaged some \$200 million per year in the years 2001-2009. As percent of total VC investments, venture investments in public equity have varied in the range of 1 to 7 percent. The year 2009 was a record year with \$316 million invested into public equities or 7.5 percent of total VC investment. However, in the years from 2010 and onwards, the fraction of venture investments in public equity has ranged from 1 to 3 percent, which is equivalent to some \$50-100 million per year. VC investments in public equity as percent of total PIPE



**Figure 2:** Deals with venture capital investments in public equity (VIPE) across sectors  
*This pie chart displays the fraction of PIPE deals with venture capital investments across industry sectors. The data is based on 1,865 (\$115.8 billion) venture capital investments in public equities over the period 1995-2014. Data is compiled from Sagient Research's database PlacementTracker*

investments show a similar pattern for most years from 2004 and onwards. These data suggests that venture investments in public equity have in fact decreased contrasting the commonly held beliefs suggesting there has been an increase. In fact, most of the venture dollars are still allocated to the private market.

## MOST ACTIVE VENTURE INVESTORS IN PUBLIC EQUITIES

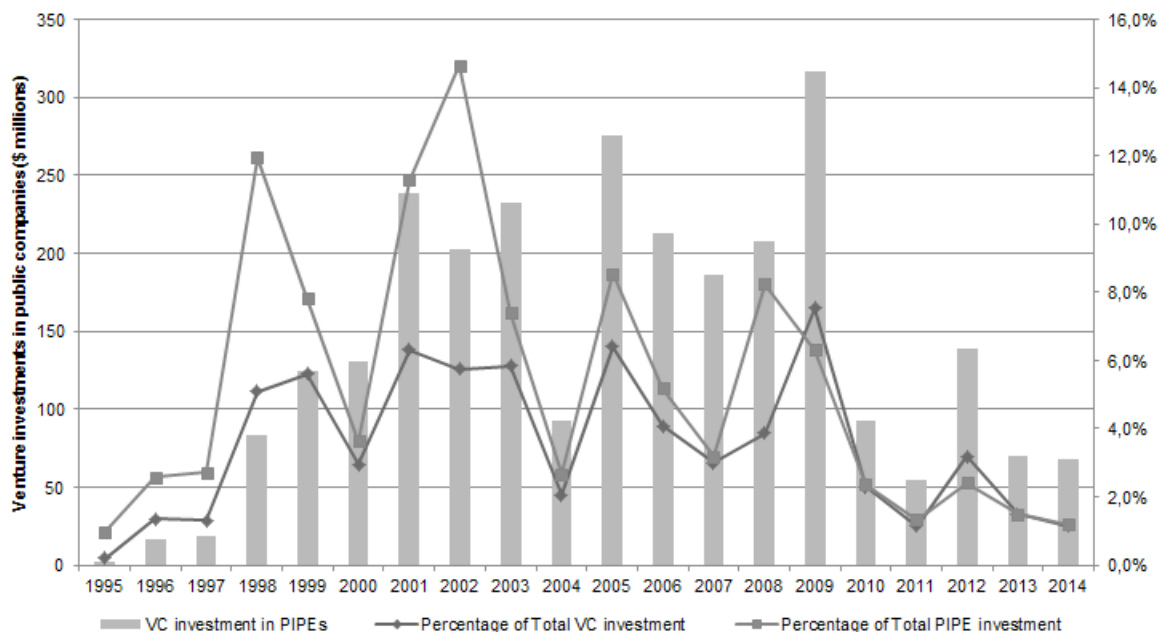
The most active venture investors in public equities (so called VIPERs) are listed in Table 2. These top-15 most active investors committed \$1,147 million or 33.7% of all venture investments in public equity in the biotechnology and pharmaceutical sector over the period 1995-2014. Domain Associates have participated in 50 investments in public equity representing a total amount of \$182 million. The second most active venture investor in the public space has been Alta Partners with 31 investments with a total dollar value of \$142 million. New Enterprise Associates \$50.2 million investment in Ardelyx in June 2015 stands out (not included in the figures in prior figures and tables), but several investments from Oak Investments Partners, Sprout Group, Essex Woodlands Health Ventures, Vulcan Ventures, Frazier

Healthcare, MPM Capital and Domain Associates exceed \$20 million. The VIPERs universe comprises 251 unique investors.

## CHARACTERISTICS OF VIPEs VS. PIPEs

There are some key differences between traditional private investments in public equity (PIPE) compared to venture investments in public equity (VIPE). These are summarized in Table 3. Venture capitalists often syndicate in the PIPE transactions, as they do in investments in private firms. For example, the private placement of \$28 million by Ocera Therapeutics announced in November, 2013, was led by new investors Venrock Associates and Vivo Ventures and joined by the existing investors InterWest Partners and Three Arch Partners. Venture investors are also often investing alongside hedge funds and other distressed funds. In the case of Ocera Therapeutics, there were additional participation from the hedge funds Deerfield, Great Point Partners, QVT Financial and RA Capital.

In a typical VIPE arrangement, the syndicate does a very large fundraising that enables the firm to reach a key value inflection point, such as clinical trial results.



**Figure 3:** Biotech venture investment in public equities (VIPEs), 1995-2014

This figure displays venture capital (VC) investments in private and public companies in the Pharmaceuticals and Biotechnology sectors during the period 1995-2014. Data on VC investments in private companies are from NVCA Yearbook 2015 (biotechnology category). Data on VC and non-VC investments in public companies in the Pharmaceuticals and Biotechnology sectors are from Sagient Research's database PlacementTracker. The total number of VC deals as reported in PlacementTracker before corrections were 609. I make several corrections to the database to arrive at a total of 468 VC deals (see Supplemental Appendix 1)

For example, the \$28 million placement for Ocera Therapeutics provided the firm with sufficient funding to advance OCR-002, developed for the treatment of hepatic encephalopathy, through the phase 2b study. The median amount raised in VIPEs is \$14 million, which is nearly the double the median gross proceeds raised in PIPEs (\$7.5 million). However, the large VIPE financing rounds comes at a cost: it may be highly diluting for existing investors who do not participate in the transaction as the share of company equity taken may be in the range of 20-50 percent including warrants. The investment horizon is typically longer, sometimes up to 5-7 years, compared to traditional PIPEs (1-2 years). VIPEs generally take longer to close in comparison to a traditional PIPE, which may be explained by the amount of due diligence that is carried out.<sup>7</sup>

Venture capitalists return goals from VIPEs are exceptionally high - anywhere from two to four times up to 10. These exceptional high return goals comes at a high risk - less than one third of issuers return the invested capital over a five year horizon. Unlike PIPE investors, who tend to be passive (although there are exceptions), venture capitalists typically take an active role in VIPEs often requiring a board representation or

sometimes negotiate certain contractual management rights. In 180 of VIPEs, or 39 percent, venture capitalists either received one or several board seats (15 percent) or were an existing board member (24 percent).

## CONTRACTING TERMS IN VIPEs

VIPEs typically target firms that are distressed (prior 12-month median return in this study is -16 percent) and where other financing sources may be limited. The bargaining power of venture capitalists enables them to extract aggressive terms for these financings and be compensated for holding illiquid stock. Consequently, the contract terms in VIPEs allocate substantial cash flow rights to venture investors, which can take the form of price discounts, warrants, dividends or interest payments, or protective features such as repricing rights that help preserve investors' capital.<sup>8</sup> Hence, a VIPE arrangement can be very costly in terms of dilution for existing shareholders that do not participate in the financing round. VC firms' demands for extra 'warrant' may also exacerbate the dilution effect (warrants are options for the firm to take up yet more shares in the future at a

**Table 1:** Biotech venture investments in private and public companies

| Year  | VC Investments in Private Companies |                     | VC and non-VC Investments in Public Companies |                        |                            | VC Investments in Public Companies as % of |                        |
|-------|-------------------------------------|---------------------|---|------------------------|----------------------------|--|------------------------|
|       | Number of deals (n)                 | Amount (\$ million) | Number of VC deals (n)                        | VC Amount (\$ million) | Non-VC Amount (\$ million) | Total VC Investments                       | Total PIPE Investments |
| 1995  | 176                                 | 832                 | 2   | 2                      | 180                        | 0.2  | 1.0                    |
| 1996  | 235                                 | 1,192               | 9   | 16                     | 620                        | 1.4  | 2.6                    |
| 1997  | 244                                 | 1,368               | 10  | 18                     | 646                        | 1.3  | 2.7                    |
| 1998  | 275                                 | 1,554               | 15  | 83                     | 615                        | 5.1  | 12.0                   |
| 1999  | 264                                 | 2,104               | 30  | 125                    | 1,474                      | 5.6  | 7.8                    |
| 2000  | 361                                 | 4,290               | 34  | 131                    | 3,481                      | 3.0  | 3.6                    |
| 2001  | 346                                 | 3,548               | 33  | 239                    | 1,877                      | 6.3  | 11.3                   |
| 2002  | 335                                 | 3,333               | 27  | 203                    | 1,184                      | 5.7  | 14.6                   |
| 2003  | 368                                 | 3,746               | 42  | 233                    | 2,915                      | 5.8  | 7.4                    |
| 2004  | 406                                 | 4,398               | 29  | 92                     | 3,368                      | 2.1  | 2.7                    |
| 2005  | 419                                 | 4,018               | 35  | 276                    | 2,949                      | 6.4  | 8.5                    |
| 2006  | 497                                 | 5,009               | 37  | 213                    | 3,902                      | 4.1  | 5.2                    |
| 2007  | 544                                 | 5,991               | 39  | 186                    | 5,644                      | 3.0  | 3.2                    |
| 2008  | 547                                 | 5,170               | 20  | 208                    | 2,311                      | 3.9  | 8.3                    |
| 2009  | 465                                 | 3,881               | 28  | 316                    | 4,691                      | 7.5  | 6.3                    |
| 2010  | 506                                 | 3,960               | 18  | 93                     | 3,840                      | 2.3  | 2.4                    |
| 2011  | 470                                 | 4,731               | 15  | 55                     | 4,048                      | 1.1  | 1.3                    |
| 2012  | 486                                 | 4,210               | 19  | 138                    | 5,582                      | 3.2  | 2.4                    |
| 2013  | 490                                 | 4,611               | 16  | 70                     | 4,597                      | 1.5  | 1.5                    |
| 2014  | 469                                 | 5,970               | 10  | 68                     | 5,623                      | 1.1  | 1.2                    |
| Total | 7,903                               | 79,916              | 468   | 2,767                  | 59,546                     | 3.6  | 4.4                    |

*This table displays venture capital (VC) investments in private and public companies in the Pharmaceuticals and Biotechnology sectors during the period 1995-2014. Data on VC investments in private companies are from NVCA Yearbook 2015. Data on VC and non-VC investments in public companies are from Sagient Research's database PlacementTracker. The total number of VC deals as reported in PlacementTracker before corrections were 609. I make several corrections to the database to arrive at a total of 468 VC deals (see Supplemental Appendix 1)*

predetermined price). It is worth noting that warrants provide the ability to align the investment horizon of venture capitalists in VIPEs with other long-term investors. In addition, warrants are only of a concern if the stock price goes up significantly, thereby limiting the dilution cost to other investors. Approximately 63.7 percent of all VIPE transactions contain a warrant component. Of these, the mean (median) warrant coverage is 53.4 (39.8)

percent. The extent of bargaining power between buyers and issuing firms typically play a role in the allocation of warrants. A clear majority of VIPEs (75.2 percent) are priced at a discount. Of those priced at a discount, the mean (median) price discount is 18.3 percent (14.3 percent). Practitioners argue that although warrants provide an upside and leveraging a successful deal, it is never a driver of a deal, as opposed to the firm fundamentals.

**Table 2:** List of most active venture capitalists in public equities over the period 1995-2014

| Venture capital firm            | Number of venture investments in public equity | Total amount invested (\$ million) |
|---------------------------------|--|------------------------------------|
| Domain Associates               | 50   | 181.7                              |
| Alta Partners                   | 31   | 141.8                              |
| New Enterprise Associates       | 21   | 146.7                              |
| Essex Woodlands Health Ventures | 20   | 91.8                               |
| Vivo Ventures                   | 18   | 34.4                               |
| Abingworth Management           | 17   | 68.6                               |
| Venrock Associates              | 17   | 61.5                               |
| Proquest Associates             | 15   | 69.0                               |
| Sprout Group                    | 13   | 136.3                              |
| Brookside Capital Partners      | 13   | 42.2                               |
| Bay City Capital                | 11   | 35.2                               |
| Sutter Hill Ventures            | 11   | 23.4                               |
| Vulcan Ventures                 | 10   | 53.0                               |
| Oxford Bioscience Partners      | 10   | 44.1                               |
| Three Arch Partners             | 10   | 17.3                               |

List of venture capitalists participating in ten or more PIPE deals (known as VIPEs) in the biotechnology and pharmaceutical industries in the US over the period 1995-2014. There are total of 251 unique venture capitalists that are involved in at least one VIPE deal or more. The data is based on 468 VC deals and is compiled from Sagient Research's database PlacementTracker. For details, see Supplemental Appendix 1.

**Table 3:** Characteristics of VIPE vs. PIPE

|                                 | PIPE   | VIPE   |
|---------------------------------|--|--|
| Investor profile                | Specialized institutional investor, such as hedge fund, mutual fund or corporation | Single venture capital firm or VC syndicate w/o specialized institutional investor   |
| Size of financing round         | Intermediate   | Large (until key value inflection point (e.g. clinical trial results), or milestone (e.g. strategic alliance, acquisition, IPO)) |
| Share of company equity taken   | 5-10%  | 20-50% (including warrants)  |
| Impact on existing investors    | Moderately diluting  | Highly diluting  |
| Investment horizon              | 1-2 years  | 5-7 years  |
| Exit strategy                   | Sell shares on open market after lock-up period                                    | Sell shares at key value inflection point  |
| Target exit multiple            | 0.5-1x   | 2.5-3x (or even up to 10x)   |
| Role of investors in management | Passive  | Active (board seat)  |

This table displays key differences between private investments in public equity (PIPE) and venture investment in public equity (VIPE). The table is modified from Mitchell (2010).<sup>6</sup>

The Nasdaq Stock Market Rule 4350, often referred to as the “20% rule”, requires that any issuer raising funds through a private placement has an obligation to price the shares at or above market value if the number of shares being sold is equal to or exceeds 20% or more of the common stock or 20% or more of the voting power outstanding before the issuance (or if insiders participate in the deal). The median proceeds as percent of market cap are 17.6 percent. Notable, 44.7 percent with available information have proceeds as percent of market cap exceeding 20 percent. Practitioners argue that a problem may arise if the issuing firms’ share price has declined and the firm needs to raise more than 20 percent to reach the next value inflection point.<sup>9</sup> In a hypothetical example a company that was valued at \$200 million a year ago and wanted to raise \$30-40 million to reach its next milestone, the 20% rule is not the binding constraint. However, if the same company is trading at \$100 million or even \$75 million, the 20% rule becomes a hard ceiling and the proceeds are limited to \$15-20 million, which may not be sufficient to reach the next milestone. One way to get around the problem with the 20% rule is to price the deal at or above market with warrants attached.

While VIPEs have been widely spread in the US, they are relatively rare in Europe. Practitioners argue that this is mostly because most market caps are too small to accommodate significant investments of \$20-40 million, which would mean that they buy 50 percent of the company and thereby have a controlling interest.

## MOTIVATIONS FOR VCS TO INVEST IN VIPEs

From a venture capital perspective, PIPEs are attractive for several reasons. First, PIPEs may provide lower risk and better liquidity than traditional venture investments. VCs are at least in theory able to resell their stake in the public market after the registration statement is filed with the SEC and declared effective. Second, PIPEs provide venture investors to buy large stakes at attractive (low) valuations, in particular for firms with solid fundamentals and robust clinical data, but with balance sheet weakness and in periods of limited outside external financing opportunities. For example, Micromet had published promising Phase I data on blinatumomab (MT103) in *Science* prior to Abingworth’s and Index Venture’s venture investment in Q4 2008.

While valuations of deals in the private market typically are anchored on the price in the last private round, the attractiveness of public deals is that they have a market price that at times may deviate significantly from

the “true” value. Unlike traditional private financing rounds, VIPEs are typically directed to de-risked assets that are either in late stage clinical trials or at the start of the commercialization phase.

VIPEs can also be used when the remaining funds available to deploy under existing capital commitments are not substantial enough to make a direct investment or when a fund is nearing the end of its investment period and the length of time for necessary due diligence is limited.<sup>8</sup> For example, Domain Associates participated in the \$50 million PIPE issued by Achillion Pharmaceuticals in August 2010. Domain Associates provided financing to Achillion from two of its funds: \$20.2 million from Domain Partners VIII and approximately \$149,900 from DP VIII Associates. In this case the investment from DP VIII Associates would likely have been too small for a direct investment in another company. This venture investment was the first by Domain Associates in Achillion and they had not invested prior to its IPO in October 2006. While it is common practice for venture capital groups in the private capital market to invest through several funds in the same portfolio firm, thereby leveraging the search costs, it is worth noting that VIPEs are not necessarily an “extension” of private investments via the same venture capital firm. In only a fraction of VIPE transactions, the same VC firm was a prior private investor.

From a management perspective, VIPEs provide issuing firms with a certification effect (or validation stamp). Finding a private placement investor willing to invest requires a favorable review of the issuing firms’ future prospects. Consequently, private placements can be viewed as the outcome of a positive selection process. VCs typically carry out lots of due diligence and are extremely selective in the deals they choose to finance as they are holding for the long term.<sup>9</sup> The certification role of bringing one or many high-profile venture capitalists can raise the firm’s profile, expand its network and improve its negotiation position in partnering discussions with pharmaceutical firms.

## VIPE EXAMPLE

Let’s illustrate with an example. In the February 2009-placement, the Norwegian biotech company Algeta raised \$35.7 million (NOK245 million) at NOK11 per share and 22.3 million shares from new and existing VCs. The price was a 29% discount to the prior day’s close of NOK15.40, and much below the IPO price of NOK47 in March 2007. As a result, the impact on existing investors was severe for those investors that did not participate in the deal - the equity dilution was 52.5% (no warrants were included in the deal). The firm launched a

subsequent “repair offering” of 3.1 million shares offered to existing investors at the same price, but was only partly subscribed (400,000 shares).

The VIPE was led by new investor Abingworth, with participation from prior venture investors Advent Private Equity Fund IV, SR One and HealthCap. As part of the VIPE investment, managing partner Joe Anderson of Abingworth took a board seat at Algeta. The investment was backed by robust clinical data - Algeta had published favorable overall survival data from a Phase II study on Alpharadin (Xofigo) in *Lancet Oncology* in 2007. The VIPE funding enabled Algeta to progress to initiate the phase 3 trial with Alpharadin with more than 900 metastatic castration-resistant prostate cancer patients.

In September 2009, Bayer and Algeta signed a favorable \$800 million global deal plus double digit royalties on sales including the option to co-promote and profit-share Alpharadin in the US. Alpharadin gained U.S. FDA approval in March 2013, and one year later, Algeta was acquired by its partner Bayer in a deal valued at approximately \$2.9 billion. The largest shareholder, the Swedish venture capital firm HealthCap (HealthCap IV; fund size of \$320 million), received about \$400 million for its 14% stake and returned a 20x multiple on its investment over the course of nine years from the initial series A investment in 2005. In comparison, Abingworth, which had passed on both the opportunity to invest in the series A round and in the IPO, earned a 24x return over the course of only five years.<sup>5</sup>

## VIPEs – LONG-TERM STOCK PERFORMANCE

How skillful are VCs in selecting the public firms that they choose to finance? Previous research in the private equity market has found that there is performance persistence of venture capital firms; the top firms are able to consistently earn superior returns from fund to fund over long periods of time.<sup>10</sup> Although the extant evidence on mutual funds and hedge funds does not generally support selectivity or performance persistence for investment in public equities, it might be argued that VCs’ accumulated industry knowledge and experience allow them to develop superior insights into firm fundamentals and to identify companies with undervalued shares. However, market efficiency argues against the idea that the issuers are mispriced.

Before examining the performance of VIPEs, let us take a first look at past research on biotech venture capitalists’ timing ability of bringing their portfolio companies public at market peaks. Early empirical evidence on

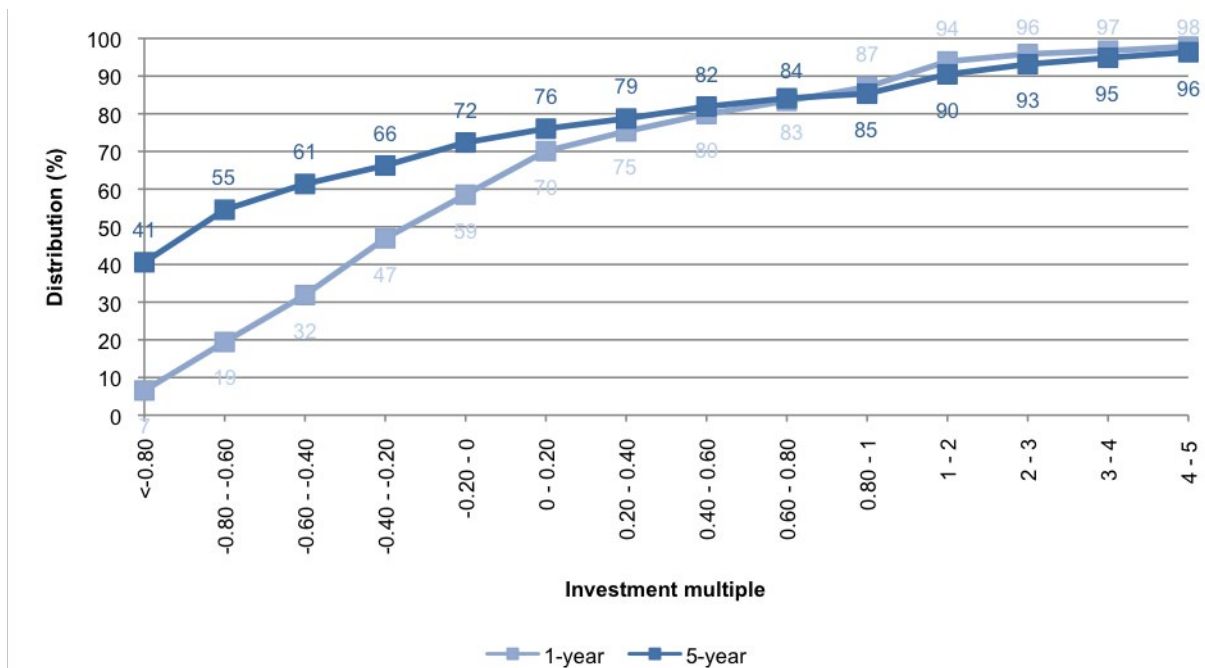
data from 1978-1992 suggested that biotech venture capitalists are good market timers: They took firms public when equity values are high and use private financings when values are lower.<sup>11</sup> More recent empirical evidence suggests that there is no consistent evidence of market timing, but instead of so called pseudo-market timing<sup>12</sup>: Venture-backed issuers react to market or sector run-ups, but do not predict downturns suggesting that they are no better than others at predicting the future.

Figure 4 reports one- and five year stock returns following VIPE issues. Over the one-year period, 59 percent of VIPEs were a loss. On the other side of the spectrum, 6% of all VIPEs generate a return of 200% or more and 2 percent generated a return multiple of 5 or more. Over the five-year period, 41 percent of all VIPE issues yield a return in the range of -80% or worse and 72 percent of all VIPE issues were a loss. Shifting gears to the higher end of the distribution in Figure 4 shows that 10 percent of all VIPEs generate a return of 200% or more and 4 percent generated a return multiple of 5 or more.

The highly asymmetrical return profile, with few big winners and a many losses, is similar to the documented<sup>13</sup> return rates in the private venture capital market. In fact, the loss rate of 72 percent is even higher than reported in the private venture capital reported of 58 percent by Booth and Salehzadeh (2011), although comparisons across studies should be made with caution. However, the results of this study confirm that also venture capital investments in public equities are a high-risk, high-return business. Although venture investments in private companies have a liquidity risk premium<sup>14</sup>, as opposed to venture investments in public companies per se, there are reasons to believe that also many public investments share the same risk factor. Many of the venture investments in public equities are in microcap companies (average market cap of \$68.6 million) with low daily turnover. Or as the venture capitalist Farah Champsy suggests – “you could see it as a longer-term private investment, only with a public ticker”.<sup>9</sup>

Panel A in Table 4 shows the raw stock returns one day after the issue announcement over different time frames spanning from 6 months to 5 years. Focusing on the one-year (five-year) period, the mean return is 25.7 (26.8) percent, whereas the median is -13.0 (-67.5) percent indicating the data is highly skewed. The fraction of delisted firms provides interesting insights: 20 percent of the VIPE issuers go bankrupt or are operating as zombie companies (penny stocks), but only 3 percent of events occurs during the first five years. In total, 33 percent of VIPE issuers are acquired and 10 percent occur during the first five years. So if investments are made with a near-term takeover by big pharma in mind – that may be driven by hope rather than on facts.





**Figure 4:** Distribution of stock returns following VIPE issues  
*This figure displays distribution of stock returns following VIPE issues over the 1-year and 5-year horizon.*

**Table 4:** Stock returns following VIPE issues

| Panel A. Post issue percentage raw returns of PIPE issuers with VC investors |     |        |         |                    |  |          |                 |               |
|--|-----|--------|---------|--------------------|--|----------|-----------------|---------------|
| Time Frame   | n   | Mean   | Median  | Standard deviation | Number of issuers that are delisted due to |          | Percentage with |               |
|  |     |        |         |                    | Bankruptcy                                 | Acquired | Positive return | Return > 100% |
| Day +1 to month 6  | 460 | 15.02% | -6.61%  | 85.38%             | 0  | 1        | 44.35           | 8.91          |
| Day +1 to month 12   | 458 | 25.68% | -12.99% | 178.28%            | 0  | 3        | 40.39           | 12.66         |
| Day +1 to month 24   | 447 | 20.19% | -33.70% | 195.67%            | 4  | 8        | 36.24           | 15.21         |
| Day +1 to month 36   | 436 | 18.05% | -50.23% | 238.59%            | 7  | 30       | 32.80           | 13.07         |
| Day +1 to month 48   | 421 | 13.29% | -58.86% | 233.83%            | 12   | 41       | 28.03           | 14.25         |
| Day +1 to month 60   | 409 | 26.80% | -67.51% | 344.92%            | 13   | 45       | 27.38           | 14.67         |

| Panel B. Post issue percentage raw returns of PIPE issuers with VC investors, hedge funds and mutual funds – 1 year |       |         |         |                    |                                 |                               |
|---|-------|---------|---------|--------------------|---------------------------------|-------------------------------|
|   | n     | Mean    | Median  | Standard deviation | Percentage with positive return | Percentage with returns >100% |
| VC-led PIPEs  | 134   | 55.56%  | -3.51%  | 243.28%            | 45.52                           | 18.66                         |
| Hedge fund-led PIPEs  | 1,094 | -3.84%  | -27.55% | 96.44%             | 30.26                           | 9.14                          |
| Mutual fund-led PIPEs   | 45    | -12.08% | -28.00% | 72.82%             | 31.11                           | 6.67                          |

**Table 4:** Continued

| Panel C. Post issue percentage raw returns of PIPE issuers with VC investors, hedge funds and mutual funds – 5 years |     |         |         |                    |                                 |                               |
|--|-----|---------|---------|--------------------|---------------------------------|-------------------------------|
|  | n   | Mean    | Median  | Standard deviation | Percentage with positive return | Percentage with returns >100% |
| VC-led PIPEs   | 84  | 52.83%  | -30.56% | 223.16%            | 39.29                           | 23.81                         |
| Hedge fund-led PIPEs   | 931 | -17.36% | -76.15% | 199.06%            | 20.62                           | 9.02                          |
| Mutual fund-led PIPEs  | 42  | -33.52% | -72.01% | 114.05%            | 22.22                           | 4.44                          |

| Panel D. Long-run abnormal returns following PIPEs using the Fama-French and Carhart factors – 1 year |                           |         |                      |         |
|---|---------------------------|---------|----------------------|---------|
|   | Venture capital-led PIPEs |         | Hedge fund-led PIPEs |         |
|   | Coefficient               | P-value | Coefficient          | P-value |
| $\alpha$  | 0.041**                   | 0.030   | -0.014               | 0.103   |
| Market- $r_f$   | 0.950***                  | 0.000   | 1.066***             | 0.000   |
| SMB   | -0.282                    | 0.609   | 0.222                | 0.390   |
| HML   | 2.229***                  | 0.000   | 0.651**              | 0.020   |
| Momentum  | 0.092                     | 0.784   | -0.140               | 0.386   |
| n (calendar months)   | 226                       |         | 249                  |         |
| F-statistic (P-value)   | 10.03 (0.000)             |         | 33.71 (0.000)        |         |
| Adjusted R <sup>2</sup> (%)   | 13.83                     |         | 34.53                |         |
| Implied one-year abnormal return (%)  | 61.31                     |         | -15.57               |         |

This table examines stock performance following PIPEs. Panel A displays raw returns of VIPE issuers over different time horizons, ranging from 6 months to 5 years. The number of observations in this panel decreases as the time frame increases because for more recent issues the measurement window extends beyond the period for which return data are available. Panel B and Panel C display the raw returns for different PIPE investors over 1 year and 5 years, respectively. A VC-led PIPE is when a VC or a syndicate of VCs buy/s the largest percentage of shares in the issuing firm's PIPE. Hedge fund-led PIPEs and mutual fund-led PIPEs are defined similarly. Panel D reports the risk-adjusted abnormal stock performance using the Jensen-alpha approach (see Supplemental Appendix 2 for details). P-values are two-tailed. \*, \*\*, and \*\*\* indicate values that are significantly different from zero at the 10%, 5%, and 1% levels, respectively.

In the public markets, venture capital investors using VIPE vehicles directly compete with other investors, such as mutual and hedge funds, on performance. Panel B and Panel C in Table 4 shows the stock returns over one- and five years for private placements that were led by venture capitalists, hedge funds or mutual funds. For example, the mean (median) one-year stock performance for VC-led PIPEs is 55.6 (-3.5) percent, which is significantly better compared to hedge fund-led PIPEs of -3.9 (-27.6) percent and mutual fund-led PIPEs of -12.1 (-28.0) percent.

Next, the risk-adjusted abnormal stock performance over the one-year period is examined (see Supplementary Appendix 2 for technical details). In the first column of

Panel D in Table 4, the dependent variable is the equal-weighted excess return of the VC-led PIPEs. The intercept,  $\alpha_p$ , which should be zero under the null of no abnormal performance, is 4.1% and statistically significant at the 5% confidence level. In the second column, the dependent variable is the equal-weighted excess return of the hedge fund-led PIPEs. The intercept,  $\alpha_p$ , is -1.4%, and not statistically significant. This difference in performance is consistent with prior research that has indicated that the investor identity matters.<sup>15</sup> Whether the outperformance of some venture groups is driven by superior monitoring, strategy and guidance, or that some VCs are simple better stock pickers than others, is an open question for future examination.

**Table 5:** Selection of acquired VIPE issuers

| Firm                     | Announcement date | Total amount raised in VIPE (\$ million) | Lead VIPE investor/s                 | Board member as part of VIPE investment                  | Acquiring firm (Announcement date)      |
|--------------------------|-------------------|--|--------------------------------------|--|---|
| Algeta                   | 02/17/2009        | 35.7                                     | Abingworth Management                | Joe Anderson (2009)                                      | Bayer (12/19/2013)                      |
| Avanir Pharmaceuticals   | 03/27/2008        | 40.0                                     | Clarus Ventures                      | Nicholas J. Simon (05/2008)                              | Otsuka (12/02/2014)                     |
| Cadence Pharmaceuticals  | 02/17/2009        | 87.4                                     | Frazier Healthcare Domain Associates | Alan D. Frazier (03/2006)*, James C. Blair (09/2005)*    | Mallinckrodt (02/11/2014)               |
| Clariant                 | 03/26/2009        | 40.0                                     | Oak Investment Partners              | Ann H. Lamont (2009) & Andrew Adams (2009)               | GE Healthcare (10/22/2010)              |
| Critical Therapeutics    | 06/07/2005        | 54.5                                     | Prospect Venture Partners            | James B. Tananbaum (06/2005)                             | Cornerstone Biopharma (05/01/2008)      |
| Ilex Oncology            | 07/01/1999        | 20.0                                     | Advent International                 | Jason S. Fisherman (09/1995)*                            | Genzyme (02/26/2004)                    |
| Leukosite                | 07/01/1998        | 11.8                                     | HealthCare Ventures                  | James H. Cavanaugh (10/1998)                             | Millennium Pharmaceuticals (10/01/1999) |
| LifeCell                 | 08/14/2003        | 15.7                                     | Essex Woodlands                      | Martin P. Sutter (12/2003)                               | Kinetic Concepts (04/07/2008)           |
| Memory Pharmaceuticals   | 10/05/2006        | 32.2                                     | MPM Capital                          | Vaughn Kailian (10/2006)                                 | Roche (11/25/2008)                      |
| Metabasis Therapeutics   | 04/16/2008        | 5.9                                      | InterWest Partners<br>MPM Capital    | Arnold L. Oronsky (09/2000)*, Elizabeth Stoner (04/2008) | Ligand Pharmaceuticals (10/27/2009)     |
| Micromet                 | 07/24/2006        | 8.0                                      | NGN Capital                          | Peter Johann (07/2006)                                   | Amgen (01/26/2012)                      |
| NuPathe                  | 09/25/2012        | 28.0                                     | Quaker Partners                      | Richard S. Kollender (10/2012)                           | Teva Pharmaceuticals (01/21/2014)       |
| Orphan Medical           | 12/07/2001        | 14.1                                     | Alta Partners                        | Farah H. Champsi (12/2001)                               | Jazz Pharmaceuticals (04/19/2005)       |
| Sirna Therapeutics       | 02/11/2003        | 48.0                                     | Sprout Group                         | James Niedel (04/2003)                                   | Merck & Co. (10/30/2006)                |
| Triangle Pharmaceuticals | 03/09/2001        | 12.0                                     | Forward Ventures                     | Standish M. Fleming (07/1995)                            | Gilead Sciences (12/04/2002)            |
| U.S. Bioscience          | 01/27/1999        | 20.0                                     | Domain Associates                    | Brian H. Dovey (02/1999)                                 | Medimmune (09/22/1999)                  |

*This table displays a selection of VIPE issuers that have been acquired in the post-VIPE period. The data is compiled from Sagient Research's database PlacementTracker. Board membership data and acquisition details are collected from corporate webpages (press releases) and DEF 14A filings from the SEC webpage (<http://www.sec.gov>). \*Indicates that they were already a board member prior to the VIPE announcement*

It is important to note that the analysis may suffer from some caveats. For example, calculated issuer returns may differ from VC returns because of warrants and price discounts, which imply that investor returns may be significantly understated. In addition, the investment horizon for VIPE investors may be significantly longer (up to 5-7 years), as documented in Table 3, compared to PIPE investors (1-2 years for hedge funds), so a direct comparison over a short-term horizon may not be fair.

It is, however, worth noting that several successful venture investments, e.g. by Venrock in Neurocrine (518% 5-year return) and Longitude Capital in Jazz Pharmaceutical (4,031% 5-year return) had a common factor – they all brought board members as part of the VIPE investments. Moreover, several of the most successful venture investments have in common that they have been taken over by pharmaceutical firms. In total, 33% of the firms that received venture funding were later acquired. A list of acquired VIPE issuers that brought one or several seats on the board as part of the VIPE investment is shown in Table 5. For example, Algeta (24x deal return), Sirna Therapeutics (557% - 5-year return), LifeCell (740% - 5-year return) and Leukosite (593% - 5-year return) were all really successful investments.

## CONCLUSIONS AND IMPLICATIONS

It is well documented that venture capitalists (VCs) are active investors in the small privately held companies they finance. The extant literature documents that this active role of VCs in small privately held firms contributes to better stock price performance and operating performance of VC-backed firms in the long run after they go public. If VCs also actively advise and monitor the management of firms issuing PIPEs, they may also be able to add value and contribute to the success of public firms.

This study examines a large sample of VIPEs in the biotechnology and pharmaceutical industry over the period 1995-2014. Contrary to widely held beliefs, there has been no significant increase in the number of VIPEs over time. In fact, both in terms of dollar amount as well as the number of VIPE transactions have actually went down post the record year in 2009.

This study documents that returns profiles from the public VC market share many similarities to the returns in the private VC market: few big winners and many losers. Approximately seven investments out of ten in public firms generate a loss. This is in fact even higher as compared to the 58 percent reported by Booth and Salehizadeh (2011) in the private venture capital market.<sup>13</sup> For the winners, approximately four percent

of venture investments in public firms generate a return multiple of 5 or more over a five-year period, which is significantly lower than the 8 percent reported in the private market in the same study. This suggests that public investing may be even more challenging than being a venture investor in the private market. However, the underlying data indicates that there is a large heterogeneity in performance among different venture capitalists, as is the case for mutual funds and hedge funds.

As the Nasdaq Biotechnology index (NBI) went from 844 in January 2009 to 4,166 in July 2015, a mere 393 percent gain and outperforming other sectors by a wide margin, it is by no surprise that the level of venture investments in public equities have remained on a low level. However, with readjustments in public valuations over the past year (the NBI is currently trading at 3,043 – a decline of 27 percent from the peak), the gap between public and private valuations has increased. So if history is guidance for the future, VIPEs may soon well be on the comeback trail as was the case in 2009. From an investment perspective, venture investors may so be able to cherry-pick from the smorgasbord of undervalued companies with late-stage assets and post-proof-of-concept data but with balance sheet weakness.

From a management perspective, venture investments in public equity provide a “new” source of potential funding<sup>6</sup> (and not only a last resort) that comes with several costs and benefits. While significant price discounts dilute preexisting shareholders in the short-term, the good news is that the warrant coverage aligns the investment horizon of venture capitalists in VIPEs with other long-term investors. In addition, warrants are only of a concern if the stock price goes up significantly, thereby limiting the cost to other investors. Finally, a major advantage with VIPEs is the certification role by one or many high-profile venture capitalists, which can raise the firm’s profile, expand its network and improve its negotiation position in partnering and M&A discussions with pharmaceutical firms. Just ask Algeta.

## SUPPLEMENTAL APPENDIX 1. PRIVATE PLACEMENTS AND SAMPLE SELECTION PROCEDURE

There are typically three types of private placements based on their legal structures: PIPEs, 144-A Convertible Transactions, and Regulation S transactions. Sagient Research, which provides PIPE data for this research, considers PIPEs as any type of Regulation D offering, Shelf Sale, or Equity Line Arrangement. Regulation D is a SEC Rule that allows public companies to issue stock privately to a group of accredited investors without the

need for public registration prior to the transaction. In contrast, Shelf Sales and Equity Line Arrangements require a registration statement to be effective prior to the sale of the stock, technically making them public offerings. This study only considers Regulation D transactions as PIPEs. Sagient Research also categorizes PIPEs into traditional PIPEs and structured PIPEs based on whether PIPE investors are price protected. PIPEs invested by VCs are predominantly traditional PIPEs. A more comprehensive description is given in Chaplinsky and Haushalter (2012).<sup>8</sup>

The sample of VIPE transactions was constructed using the Sagient Research's database PlacementTracker. The initial sample consists of 609 VIPE deals in the Biotechnology and Pharmaceuticals industry that were closed between January 1994 and December 2014. I make several corrections to the database. These corrections include 38 observations that relate to venture loan arrangements (by Hercules Technology, Horizon Technology Finance or Venture Lending and Leasing V) that are classified as venture capital firms in the Sagient Research database, and 103 observations that did not specify the amount of VC investment, were made by venture arms of pharmaceutical firms (e.g. J&J's equity investment in Achillion through their corporate venture capital arm, JJDC), or for another reason. After corrections, the final sample includes 468 VIPE deals.

Foreign companies are excluded for the purposes of this analysis. It is, however, important to note that the international evidence of venture investments in public equities is scarce. According to Sagient Research's PlacementTracker, there are only a handful of venture investments in public equities in Europe. These include Algeta (Norway), Cytos Biotechnology (Switzerland), Epigenomic (Germany), Evolva (Switzerland), IS Pharma (United Kingdom) and Orexo (Sweden). Stock price data was collected from CRSP and the Thomson Reuters Datastream database.

## SUPPLEMENTAL APPENDIX 2. MEASURING LONG-TERM STOCK PERFORMANCE

To examine the risk-adjusted abnormal stock performance over the long-term horizon for PIPE issuing firms, I employ the Jensen-alpha approach (also known as the calendar-time portfolio approach).<sup>2,15-16</sup> In each calendar month over the entire sample period, a portfolio is constructed comprising all firms that announce a PIPE within the previous 12 months. Portfolios are rebalanced on a monthly basis as some new firms are added each month and some firms exit each month. The monthly

portfolio excess returns are regressed on the three Fama-French (1993)<sup>17</sup> factors and the momentum factor proposed by Carhart (1997)<sup>18</sup> as follows:

$$R_{p,t} - R_{f,t} = \alpha_p + b_p(R_{m,t} - R_{f,t}) + s_p SMB_t + h_p HML_t + m_p UMD_t + e_{p,t}$$

where the four factors are zero-investment portfolios representing the excess return of the market.  $R_{p,t}$  is the equal-weighted return for calendar month  $t$  for the portfolio of issuing firms that experienced the event within the previous 12 months,  $R_{f,t}$  is the risk-free rate (US Treasury Bills),  $R_{m,t}$  is the return on the market portfolio (Nasdaq Biotechnology index),  $SMB_t$  is the difference between the return on the portfolio of "small" stocks and "big" stocks (by market capitalization),  $HML_t$  is the difference between the return on the portfolio of "high" and "low" book-to-market stocks,  $UMD_t$  (or *Momentum*) is the difference between the return on the portfolio of "high" ("winners") prior momentum stocks and "low" ("losers") prior momentum,  $\alpha_p$  is the average monthly abnormal return (Jensen's alpha) on the portfolio of issuing firms over the 12-month post-event period,  $b_p$ ,  $s_p$ ,  $h_p$ ,  $m_p$  are regression coefficients (betas) of the event portfolio to the four factors, and,  $e_{p,t}$  is the error term. To examine the economic significance of  $\alpha_p$ , I calculate the implied one-year abnormal performance, which is measured as  $(1+\alpha)^{12}-1$ . This is the total buy-and-hold return from earning the intercept return every month for 12 months.

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