Venture-backed IPOs: Performance from the Public Investor Perspective

An Analysis of Venture-Backed IPOs 1993-2012

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I.   SUMMARY

This research examines the cumulative returns from venture-backed US initial public offerings (IPOs), and their performance for public investors against other types of IPOs (private-equity-backed, owner-backed, etc.) To address this, I have compared IPO returns against the S&P500 over consistent time frames to distinguish firm performance from market performance, with a baseline for each IPO as its price at the end of the first trading day to reflect prices available to public equity investors. The research examines two investible strategies – an "equal buy-in" strategy that considers buying IPOs at the baseline and holding for set time frames, and a "rebalanced portfolio" strategy that invests a set amount of capital and rebalances based on the number of IPOs in the sample.

Using an "equal buy-in" strategy, venture capital (VC)-backed firms outperform other types of IPOs in the short-term, from two weeks to three months after an IPO. But over the long-run, VC-backed IPOs, when adjusted for survivorship bias, underperform the market in every time period studied after the first three months using an "equal buy-in" strategy. In the "rebalanced portfolio" strategy, VC-backed IPOs outperform both the market and other IPO types across all time periods studied. This suggests while buying and holding VC-backed IPOs for set periods of time may result in underperformance for public investors, creating a portfolio of VC-backed IPOs that rebalances over time may outperform the market.

II.   BACKGROUND

Over the past twenty years (1993-2012), there were over 2,000 US-based venture capital backed companies that completed an IPO on the U.S. public markets, with a peak of over 250 in

the single year 1999.[1] Recently, large venture-backed companies such as Facebook and Groupon (and very recently, King Digital) have come under scrutiny for being overvalued at the time of their initial public offering. Specifically, Bloomberg News reported in reference to Facebook's IPO: "the IPO produced the worst five-day return among the largest US deals of the past decade."[2] Although Facebook stock has since recovered, the event called into question the value of venture-backed IPOs to public investors.

Venture capital firms must exit their positions in order to return capital to their investors. IPOs represent only a minority of these exits (especially in recent years), with only 8%-14% of venture-backed exits resulting from IPOs, according to Ernst and Young.[3] And although the IPO market is recovering from the most recent financial crisis, experts in the venture capital industry point to potential new issuers requiring greater periods of profitability and higher annual revenues for the market respond well to an IPO.[4] But as we have seen, although venture-backed IPO exits are generally reserved for the largest, most profitable companies in venture firms' portfolios, performance of these IPOs can yield variable results, making it unclear if investing in venture-backed IPOs is an outperforming strategy for public equity investors. The research addresses this issue by comparing the returns of venture-backed IPOs to other IPOs and market returns over time.

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[1] National Venture Capital Association at Nvca.org
[2] http://www.taipeitimes.com/News/biz/archives/2012/05/27/2003533804
[3] http://www.ey.com/Publication/vwLUAssets/VC_backed_IPOs-Outperforming_the_market/$FILE/VCR%2028_Annual%202012_EY.pdf
[4] http://www.forbes.com/2010/03/05/venture-capital-ipo-entrepreneurs-finance-wharton.html

III. METHODOLOGY

The methodology for this research began with identifying the universe of IPOs. To do this, I used SDC Platinum to select all US issues of common stock via IPO. This resulted in 5,367 IPOs over 1993-2012 that met three criteria:

- Listed as an IPO in the timeframe in SDC Platinum

- Was on a major American exchange (NYSE, NASDAQ, AMEX) and issued a CUSIP

- Had a CUSIP that matched in the CRSP dataset

The sample includes 5,367 IPOs, 2,887 venture capital or private equity firms that were investors in each company prior to its IPO, and 2,112 unique investment bank managers for these IPOs. The next step was to collect security pricing. Using the CUSIP for each IPO, I linked the IPO data to the CRSP database to collect daily returns for each security from its IPO date onward. I also collected returns of the S&P500 in order to normalize for changes in market performance over time.

The resulting dataset contained over 9 million data points of daily returns. From this dataset, I identified two investible strategies to investigate. The first strategy, which I will call the "equal buy-in" strategy, proposes that the investor buys one monetary unit of stock (for example, $1 worth), of each IPO that comes to market, and measures the overall returns if the investor sells after a fixed number of trading days from the IPO.

For this strategy, I used the daily return data and tracked the number of trading days for each security. I then retrieved the cumulated returns at 1, 5, 21, 63, 252, 756, and 2520 trading days (corresponding to one-day, one-week, one-month, three-month, one-year, three-year, and

ten-year returns) in order to analyze the IPOs on a consistent basis. The baseline (day zero) price for calculating returns was the closing price on the first day of public trading to reflect the returns for a public equity investor.

To correct for survivorship bias, any security that exited the sample had its last reported price held constant to calculate the total returns for subsequent periods (for example, if a security left the sample at a final return of -96.0% in between 252 and 756 trading days, it would be included at that return when calculating 756 day returns and 2520 day returns). This helps take into account firms that went bankrupt, were acquired, or were taken private.

Using this data, I analyzed the straight cumulated returns and cumulated returns against the S&P500. I categorized each firm into one of four buckets taken from SDC Platinum's database – VC-backed, PE-backed, VC-and-PE-backed, or owner-backed. I calculated average returns for each category at the various time periods identified earlier to give a view of average returns over short, medium, and long-term holding periods. I compared short-term and long-term results to determine if there were specific timeframes of outperformance or consistent outperformance of the market by these IPOs. Additionally, I used the names of the actual investors and lead managers to determine if there was any investor or lead manager effect on the returns.

The second strategy, which I will call the "rebalanced portfolio" strategy, proposes to invest one monetary unit total (for example, $1) at the beginning of the period, and reweight the portfolio any time a security enters the sample (a new IPO) and/or exits the sample. The total amount left in the portfolio is redistributed equally across the new portfolio on each day that a firm enters or exits the sample. For example, upon the first IPO in the sample, the whole $1 will

be invested in that security, until a second IPO enters the sample, at which the value of the portfolio will be split between the first IPO and the new IPO, and the portfolio will have two securities in it with equal allocations.

Using this strategy, I calculate cumulated returns (both straight returns, and relative to the S&P500) beginning on Jan 1 for each year in the sample. I do this for holding periods of one-year, three-years, five-years, and ten-years. This enables examination of each version of the "rebalanced portfolio" strategy over the course of several years.

I break down this strategy by the four different categories of PE/VC-backed, PE-backed, VC-backed, and owner-backed. Thus, I am able to see if the "rebalanced portfolio" strategy tends to perform better for venture-backed IPOs versus other IPOs, and against the market itself. Survivorship bias is naturally taken into account, as the portfolio is rebalanced each time a firm exits (or enters) the sample, and any contribution from that security is redistributed across the portfolio.

IV. DATA SELECTION

The dataset contains 5,367 IPOs across four major categories – PE/VC-backed (both PE and VC), PE-backed, VC-backed, and owner-backed. The categorization comes directly from the SDC Platinum database. The distribution across the four categories is as follows:

Table 1: Firm Count by Type

	# of Firms	% of Total
PE-Backed	72	1%
VC-Backed	530	10%
PE and VC-Backed	1606	30%
Neither PE nor VC	3159	59%
Total	*5367*	*100%*

As the data show, owner-backed IPOs dominate the sample, comprising over half of the sample firms. VC-backed companies are the other dominant type of firm, representing close to 30% of firms. The timing of entry into the sample varies across firms. Chart 1 below shows the net flow of firms in the sample, peaking in 1997 with over 2,500 firms total driven by a high amount of growth in owner-backed IPOs:

Chart 1: Firm Count and Type over Time
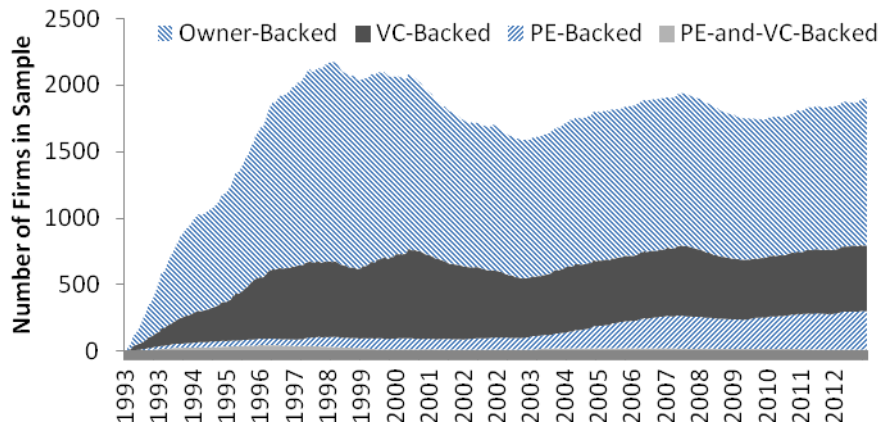
The size of the sample is driven by both new issues and exits from the dataset. Chart 2 below shows new IPOs by year, followed Chart 3 which shows the number of firms each year that exit the dataset:
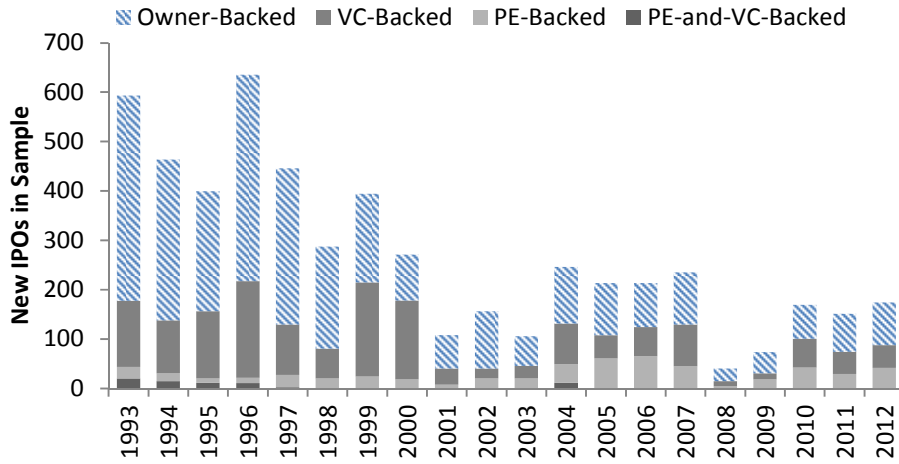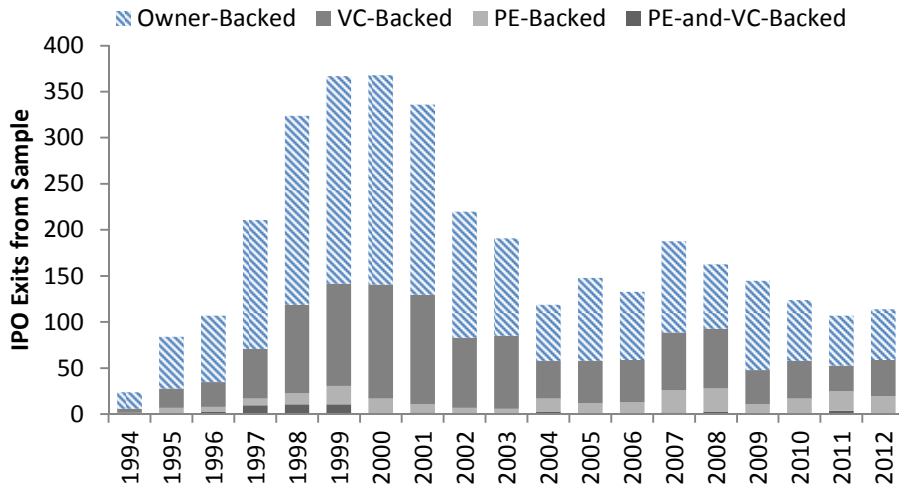
Chart 2: New Firms by Type over Time

Chart 3: Firm Exits by Type over Time

Charts 1-3 tell an interesting story, as overall IPOs peaked in 1996, driven by a large number of owner-backed IPOs coming to market. In my sample, however, although owner-backed IPOs dropped by over half from 1996 to 1999, VC-backed IPOs stayed nearly flat. This

is an indication that the market appetite for the riskier type of firms that VCs typically invest was relatively much higher in 1999 than owner-backed companies which may exist across a range of industries.

We also see from the new firm data that the IPO exuberance of the late 1990s was never replicated after the dot com bubble. After 2000, new IPOs peaked at 246 in 2004, less than 40% of the overall sample 1996 peak of 635 IPOs. Interestingly, PE-backed IPOs peaked in 2005-6, even as IPOs contracted overall (in fact, those two years were two of the only three that PE IPOs outnumbered VC IPOs in the sample). PE has seemed to fill in the gap left by owner-backed and VC-backed IPOs in the market.

The firm exit data further highlights the damage of the dot com crash. While it is true that an exit could mean a firm is acquired or taken private, we will see later that the returns from these exited firms on average are much lower than surviving firms. Although there is a noticeable spike in firm exits during the latest financial crisis, the sum of exits from 1999-2001 is more than twice the sum of exits from 2007-2009.

V.   EMPIRICAL RESULTS: THE PERFORMANCE OF TWO ALTERNATIVE INVESTIBLE STRATEGIES

V.1 "Equal Buy-In" Strategy

Results from the "equal buy-in" strategy indicate that while VC-backed IPOs are the highest performing IPOs and outperform the market in the short run (between two weeks and three months), over time VC-backed IPOs are outperformed by PE-backed IPOs and eventually lag the market after the first year. This indicates that VC-backed investments may be beneficial

to public equity investors for a short-term investment, but may not be an outperforming investment strategy for long term investors.

This result is not entirely surprising, since as we saw the number of venture-backed IPOs tend to rise in the run-up to market bubbles and then sharply decline during recessions. Thus, in the run-up to a bubble, the market is rewarding venture-backed IPOs, but as time goes on and the market turns south, venture-backed companies become less popular than the market as a whole and underperform over longer periods of time.

The following tables 2-3 show annualized returns over the various time periods I studied IPO returns. Table 2 shows straight returns, while Table 3 shows returns above the S&P500. Both tables show returns both unadjusted and adjusted for survivorship bias. Also, please note that these are annualized returns over a 252 trading day year. Thus, a 0.43% one-day average return will translate to a 198% annualized return.

The tables highlight that VC-backed companies appear to beat other IPOs and the market starting two weeks after the IPO and continuing through three months after the IPO. However, after the three month mark, VC-backed IPOs begin to lag PE-backed IPOs in performance, and after one year onward, lags the market when survivorship is taken into account.

Table 2: Annualized IPO Returns by Investor Type – Unadjusted and Adjusted for Survivorship Bias

Return Period	PE-and-VC		PE		VC		Neither		Total	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
One Day	197.6%	197.6%	131.6%	131.6%	227.2%	227.2%	48.0%	48.0%	98.0%	98.4%
One Week	-42.9%	-42.9%	2.9%	2.9%	3.1%	0.5%	-8.7%	-10.4%	-4.8%	-6.5%
Two Week	-2.5%	-2.5%	15.1%	15.1%	36.9%	35.3%	-7.6%	-8.6%	6.4%	5.3%
One Month	22.6%	22.6%	13.3%	13.3%	97.4%	96.2%	7.8%	7.0%	30.5%	29.8%
Three Month	40.4%	40.4%	26.0%	25.3%	49.4%	49.1%	10.3%	10.1%	23.1%	22.9%
Six Month	29.6%	29.6%	18.2%	18.0%	15.3%	15.4%	5.5%	5.7%	10.0%	10.1%
One Year	16.9%	16.9%	9.7%	10.0%	6.8%	7.7%	3.4%	3.5%	5.2%	5.5%
Three Year	16.4%	13.9%	4.0%	5.6%	11.5%	8.1%	8.6%	5.4%	9.2%	6.4%
Five Year	14.2%	7.6%	5.0%	5.5%	10.2%	6.5%	8.0%	4.4%	8.5%	5.2%
Ten Year	18.3%	8.5%	8.6%	5.2%	10.0%	4.4%	11.7%	5.4%	11.3%	5.2%

Table 3: Annualized IPO Returns Above the S&P500 by Investor Type – Unadjusted and Adjusted for Survivorship Bias

Return Period	PE-and-VC		PE		VC		Neither		Total	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
One Day	158.0%	158.0%	130.9%	130.9%	210.2%	210.2%	21.1%	21.1%	72.8%	73.2%
One Week	-47.7%	-47.7%	-2.1%	-2.1%	-5.9%	-8.5%	-20.6%	-22.4%	-15.2%	-17.0%
Two Week	-9.9%	-9.9%	8.2%	8.2%	22.5%	20.9%	-17.8%	-18.8%	-4.6%	-5.7%
One Month	14.0%	14.0%	5.8%	5.8%	78.2%	77.0%	-2.9%	-3.7%	18.1%	17.4%
Three Month	27.9%	27.9%	17.5%	16.8%	36.3%	36.0%	-1.1%	-1.2%	11.4%	11.3%
Six Month	16.3%	16.3%	8.8%	8.7%	4.7%	4.8%	-5.6%	-5.5%	-0.9%	-0.8%
One Year	4.6%	4.6%	1.9%	2.1%	-3.0%	-1.9%	-7.9%	-7.8%	-5.3%	-4.9%
Three Year	0.8%	-1.1%	-0.2%	0.6%	1.3%	-1.0%	-2.8%	-5.2%	-1.3%	-3.4%
Five Year	1.1%	-3.9%	2.6%	1.8%	2.3%	-0.7%	-0.8%	-3.7%	0.4%	-2.3%
Ten Year	10.5%	1.5%	3.6%	1.0%	5.2%	-0.2%	5.0%	-0.3%	5.1%	-0.2%

Chart 4: Annualized Returns above S&P500 by IPO type and Time Period (Adjusted for Survivorship) – *One Day to Three Months from IPO*
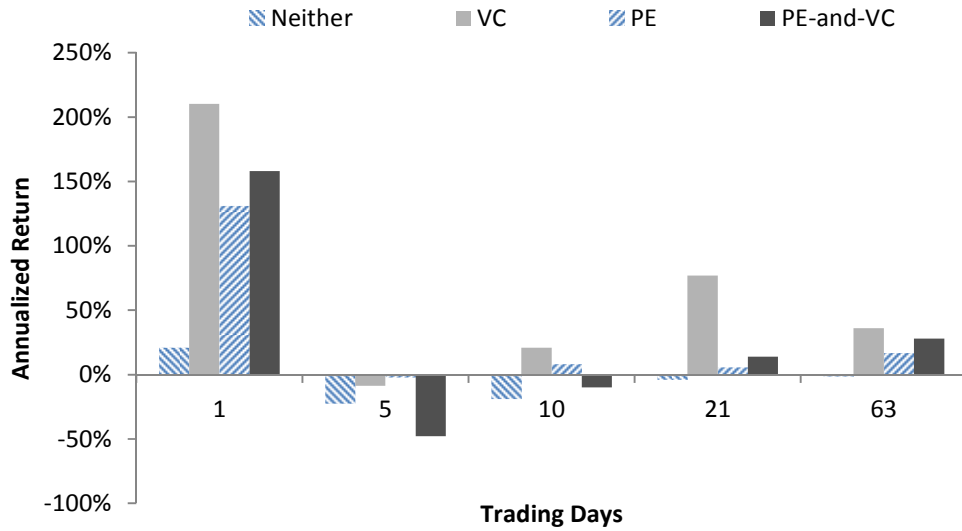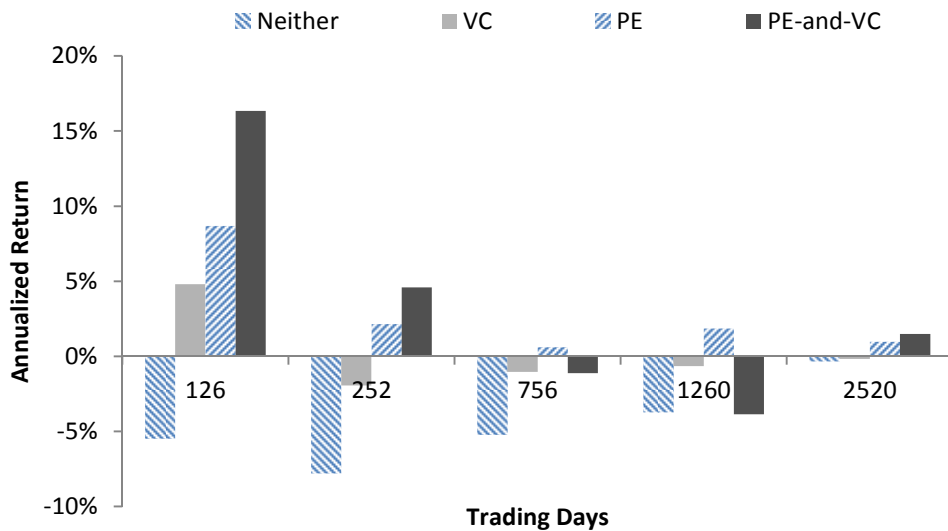

Chart 5: Annualized Returns above S&P500 by IPO type and Time Period (Adjusted for Survivorship) -- *Six Months to Ten Years from IPO*

V.1.a Survival Rates

Another interesting dimension of the sample has to do with survival rates of IPOs. As mentioned before, IPOs may exit the sample from either going bankrupt or via being acquired. To explore the difference in performance between surviving firms and firms that exit the sample, I explore the ten-year survival rate for firms that IPO'd between 1993-2002 (firms that had an IPO after this date would not have ten years' worth of data in the sample). Table 4 below summarizes the difference in results for survivors over the ten-year period.

Table 4: Ten-Year Survival Rates – IPOs 1993-2002 (n=3,751)

	Exits		Survivors		Total
Backing Type	*Count*	*Annual Return Above S&P*	*Count*	*Annual Return Above S&P*	*Survival Rate*
PE/VC	43	-3.8%	15	9.8%	26%
PE	120	-0.3%	52	3.4%	30%
VC	865	-2.5%	273	5.1%	24%
Neither	1592	-4.4%	791	5.0%	33%
Total	*2620*	*-3.6%*	*1131*	*5.0%*	*30%*

Overall, we see that VC-backed firms have the worst survival rate, at 24%. We also see that firms that exit the sample tend to do so with a negative return compared to the S&P500. Survivors, on the other hand, after ten years have a positive return above the S&P500 for all types of backing. This is an indicator that firms exiting the sample generate poor returns for public investors versus the S&P500 benchmark. Companies that IPO and have longevity deliver superior returns to their investors over time.

Additionally, it is interesting to examine the reasons a firm might exit the sample. The two general scenarios in which a firm exits the sample are: 1) The firm is taken private or is acquired,

or, 2) The firm ceases to exist. By examining the final return data on companies that have exited

the sample, we can examine the relative frequency of each scenario.

Of the 3,472 firms that exited the sample over the whole course of the time period 1993-

2012 (versus 2,620 exits in the table above, which looked at 1993-2002 IPOs), fewer than 39%

earned positive rates of return for investors. A similar percentage, 37%, lost over 75% of their

value before exiting the sample. While many of these exiting firms appear to have returned

capital to their investors, a spot check on some of the securities generating the lowest returns

reveals several cases where firms went "belly up" returning virtually nothing to shareholders.

Hybrid Networks, a former broadband equipment maker, is one of these cases. It had the

worst return of any firm that exited the sample, returning less than two hundredths of a penny for

each dollar invested at the close of its first trading day. An article from 2002, when it exited the

sample, states: "Strapped for cash and unable to come up with a transaction, sale or merger for

its assets, fixed wireless broadband provider Hybrid Networks Inc. called it quits…"[5]

On the other hand, there are several success stories among firms that exited the sample.

Ascend Communications, a communications equipment manufacturer, returned investors $56 for

every dollar invested when it was purchased by Lucent Technologies (now Alcatel-Lucent) in

1999 for $20.3B.[6] Exiting the sample is not necessarily a bad omen for investors, but as Table 4

indicated, the survivors typically outperform the firms that exit the sample. Among the firms

that exited the sample, the median return for a firm was -38.5% at the time of the exit. Chart 6

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[5] http://www.internetnews.com/infra/article.php/999791/Hybrid+Networks+Closes+Up+Shop.htm
[6] http://articles.latimes.com/1999/jan/14/business/fi-63310

below shows log scale returns on a dollar invested in firms that exited the sample. 61% fall

below the break-even line and lose investors' money at the time of exiting the sample.

Chart 6: Log Scale Returns of Firms Exiting Sample 1993-2012 (n=3,472)
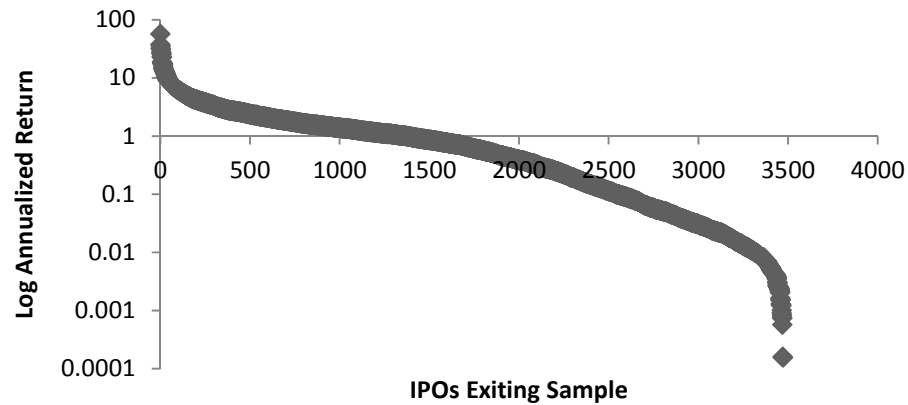
V.1.b Limitations

There are several limitations to the "equal buy-in" strategy. The most important which

could prevent this from becoming an actionable investible strategy are the lack of a fixed

investment budget, the lack of a fixed time frame, and the lack of a reinvestment strategy for

firms that return money before the end of the divestment period. First I will address the lack of a

fixed investment budget. To follow this strategy, the investor must invest a fixed nominal

amount each time an IPO comes to market. In some years, like 1996, this would require $635 to

execute the strategy. In a year like 2008, however, only $40 would be needed. For an investor

who wishes to invest a fixed amount each year, it would be difficult to make "equal buy-in"

actionable as an ongoing strategy.

Next, there is a lack of a fixed timeframe. While this strategy fixes the holding period of any one security, the lumpiness in when the securities come to market make it difficult to set a definite investment timeframe, especially if you have a fixed budget.

Related to the aforementioned limitation, this strategy does not address how to reinvest funds that come from early exits from the public equity markets. If an investor follows the strategy to invest in venture-backed companies for the first six months and then exit, a firm that is acquired after two months of being public will simply return the two month investment to the investor without directing the investor on how to reinvest this money.
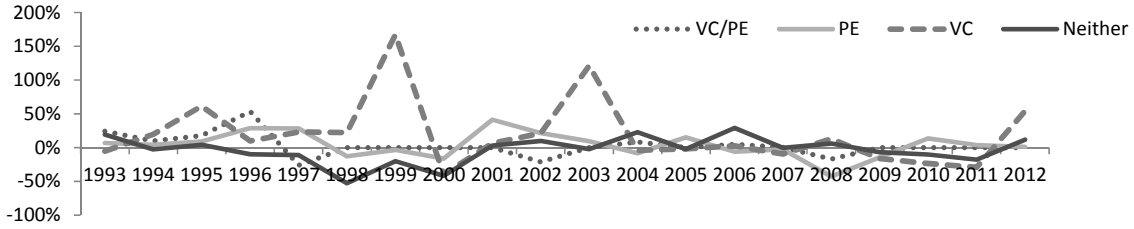
V.2 "Rebalanced Portfolio" Strategy

The other strategy I examine is the "rebalanced portfolio" strategy which invests the entire investment budget at the beginning of the period and reallocates the money in the portfolio whenever a new security enters the portfolio and/or one exits the portfolio.

This strategy alleviates many of the limitations of the "equal buy-in" strategy. While it has some limitations of its own that we will address later, this strategy can be executed on a fixed budget, over a fixed timeframe, and with a built-in mechanism to reinvest proceeds from exits (and thus automatically correct for survivorship bias).

To evaluate the efficacy of this strategy, I've examined the one, three, five, and ten-year holding returns following this strategy, with each year representing a different start point of the portfolio. For example, the 1995 portfolio will consistent of IPOs that came to market on or after January 1, 1995. The following charts summarize the findings from the "rebalanced portfolio" strategy.
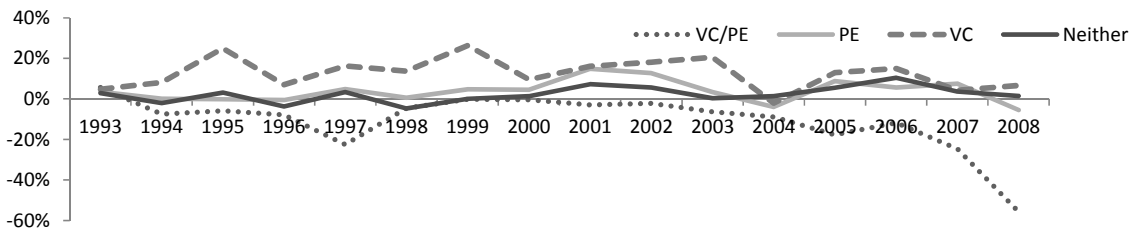
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Chart 7: Annualized One-Year Returns Above S&P500 of Rebalanced Portfolio Strategy

(with Different Starting Years)

Chart 8: Annualized Three-Year Returns Above S&P500 of Rebalanced Portfolio Strategy

(with Different Starting Years)
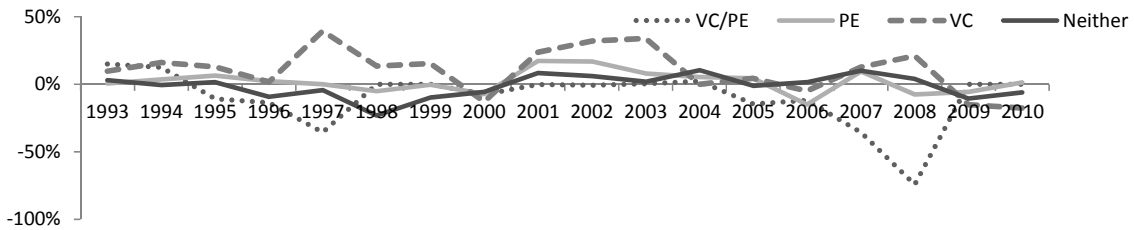
Chart 9: Annualized Five-Year Returns Above S&P500 of Rebalanced Portfolio Strategy

(with Different Starting Years)

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Chart 10: Annualized Ten-Year Returns Above S&P500 of Rebalanced Portfolio Strategy
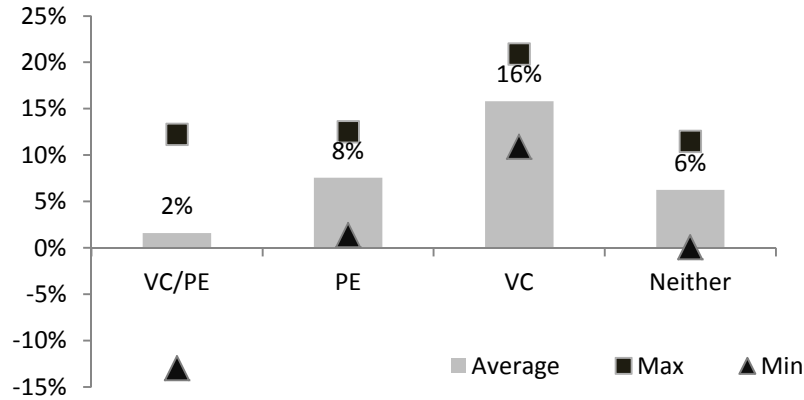
(with Different Starting Years)
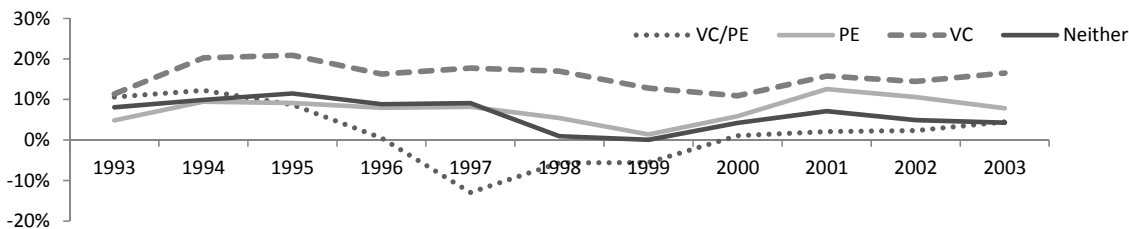
In contrast to the "equal buy-in" strategy, the "rebalanced portfolio" strategy shows VC-backed investments as the best IPO investment, on average, for every holding period studied. Although the result may be unintuitive, there is a reasonable explanation for this outperformance. We saw that VC-backed companies tend to do well early on in their lives. In the "rebalanced portfolio" strategy, the performance at the beginning of the strategy is crucial to the success of the strategy since there are very few securities in the portfolio at the beginning of the investment period.

Additionally, constantly infusing the portfolio with new IPOs that perform well in the very short term can provide a constantly refreshed source of growth for the portfolio. In fact, in 1999, right in the run-up to the dot com bust, investing for one year and rebalancing VC-backed firm portfolios would have beat the market by 167% - the largest outperformance of any year in the sample for any backing type.

The outperformance for VC portfolios persists in the long-term as well. This is encouraging for long-term investors interested in pursuing this strategy. In fact, the ten-year holding period sample for VC portfolios did not have any starting years in which the strategy underperformed the S&P500, and the VC portfolio also outperformed the other IPO types in

every starting year for the ten-year holding period. Chart 11 below summarizes the average, maximum, and minimum annualized returns of the ten-year holding period by backing type.

Chart 11: Average, Maximum, and Minimum Annualized Ten-Year Returns Above S&P500 of Rebalanced Portfolio Strategy, by Backing Type

Across all time frames examined here, on average the VC portfolio has outperformed both the S&P500 and other backing types. Table 5 below summarizes the average return over all starting years for different backing types.

Table 5: Average Annualized Returns Above S&P500 of Rebalanced Portfolio Strategy, by Backing Type and Holding Period

	# of Years			
	One	Three	Five	Ten
VC/PE	6%	-13%	-12%	2%
PE	4%	2%	4%	8%
VC	20%	10%	13%	16%
Neither	-4%	-1%	2%	6%

V.2.a Limitations

The primary limitation of this strategy is the dependence on the returns of the initial

investment one makes into the portfolio. For the any portfolio, the performance of the first few

IPOs that come to market will have an outsize impact on the success of your investment strategy.

This is alleviated over time as the portfolio broadens and diversifies, but similarly to how a string

of initial bad luck in roulette can severely impair a gambler's wallet, initial losses in the portfolio

can put an investor in a hole before he or she gets to experience the benefits of a diversified

portfolio.

Another limitation in comparing results is the timeframe involved. When comparing one-

year returns, we can use IPOs that come to market from January 1, 1993 through December 31,

2011. However, when examining ten-year returns, the latest IPO that can be included is from

December 31, 2002. If IPO return behavior varies significantly across timeframes, then the

results may be skewed by this bias.

VI.   EXTENSIONS

VI.1 Managerial Effects

One hypothesis to explain the variation in returns across IPOs is that the presence of a

specific investment banking manager in a deal (rather than the investment backing type) can be

an indicator of performance in IPOs. While not a primary focus of this research, the dataset

includes information on managers, and I explore the possibility that certain firms outperform at a

statistically significant level. I calculated the average annual return above the S&P500 for IPOs

managers participated in, as well as the standard deviation of those IPOs. Note that multiple managers often participate in the same IPO.

To adjust for potential outliers, I plot the number of IPOs by each manager versus that manager's average market-adjusted return. I calculated a t-statistic for the mean return of each firm versus the mean return of all other firms. Under this assumption, roughly 4.0% of the managers outperformed the rest of the field at a 97.5 significance level for ten-year IPO returns – representing 37 of the 925 managers in the ten-year sample (n=1705). To count as significant, managers had to bring to market at least 30 IPOs and have a one-tailed t-score above 1.95 with n=1705 (97.5 percentile). Table 6 below shows firms that brought over 30 IPOs to market between 1993-2002 and whose IPOs have the highest outperformance above the S&P500. I have also included the t-statistic in order to indicate the significance of this outperformance:

Table 6: Highest Outperformance for Ten-Year IPO Returns by Manager

Manager Name	Count of IPOs	Annual Return Above S&P500	t-Statistic
Furman Selz LLC	34	13.0%	6.11
BancAmerica Robertson Stephens	39	11.6%	5.73
Credit Suisse First Boston	38	11.4%	5.49
Cowen	79	10.9%	7.48
Adams Harkness & Hill Inc	43	10.4%	5.19
Friedman Billings Ramsey Group	31	10.0%	4.22
Montgomery Securities	70	8.0%	4.69
Alex Brown & Sons Inc	109	7.9%	5.77
Goldman Sachs & Co	197	7.7%	7.46
NationsBanc Montgomery Sec	58	7.0%	3.51
Morgan Stanley Dean Witter	100	7.0%	4.60
Brean Murray & Co Inc	37	7.0%	2.80
Smith Barney Inc	88	6.9%	4.27
JP Morgan	73	6.9%	3.84
Deutsche Bank Securities Corp	52	6.7%	3.10

Among this sample, Furman Selz emerges as the firm that has most consistently generated returns above the S&P500 on their IPOs looking at ten-year returns. However, Goldman Sachs emerges as the firm most significantly associated with outperformance with a t-statistic 7.46 since they have consistently beaten the S&P500 with a larger number of IPOs. Other firms among the outperforming banks include Morgan Stanley & Co, JP Morgan, and, Salomon Smith Barney.

Chart 12 depicts the number of IPOs versus performance for each manager. The darker diamonds highlight outperforming firms on the basis of their t-statistic. Further exploration of this topic over other time periods may shed more insight into firms that consistently deliver outperformance as a manager. Note that this chart only includes 925 (versus the 2,112 that are in the sample) because only 925 managers brought IPOs to market over the time period 1993-2002 which I use to calculate ten-year returns.

Chart 12: Ten-Year Annualized Return (Market-Adjusted) by Manager and # of IPOs (n= 925 Managers; 1705 IPOs)
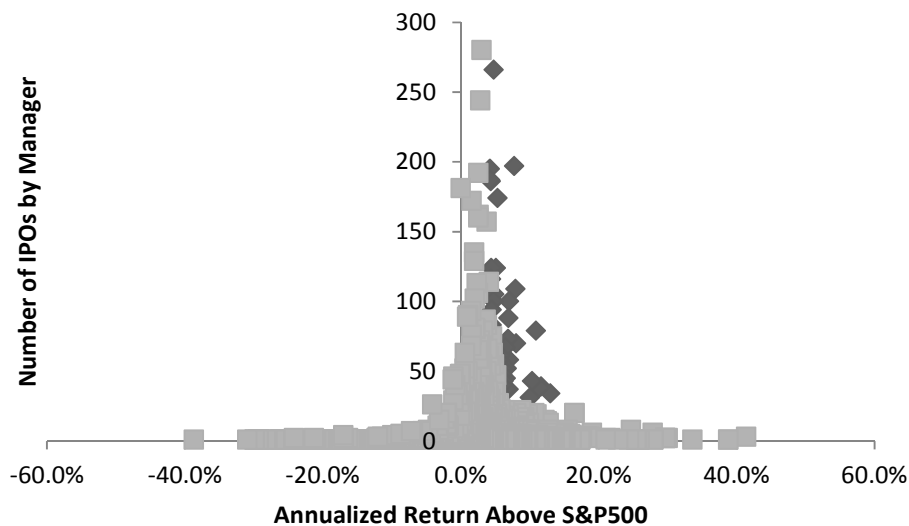
One potential limitation of this analysis is that it does not take into account the timing of IPOs. For example, an investment bank that brought to market most of its IPOs in an up year may benefit from market timing rather than adding specific skill to the issue.

VI.2 Investor Effects

Similarly to managerial effects, I conducted an initial study of investor effects – that is, attempting to determine if companies backed by particular VC or PE firms are more likely to outperform the market. I took a similar approach to assessing managers in determining outperformance using t-statistics at the 97.5 percentile as the cutoff. I also, similarly restricted my analysis to ten-year returns on IPOs, and I only included investors if they had backed at least five IPOs between 1993-2002.

Table 7: Highest Outperformance for Ten-Year IPO Returns by Investor

Investor	Number of IPOs	Annual Return Above S&P	t-Statistic
Matrix Partners LP	5	24%	4.40
Bessemer Venture Partners L P	7	22%	4.76
Adler & Company Inc	6	21%	4.29
Accel Partners & Co Inc	8	19%	4.43
J.H. Whitney & Co LLC	5	18%	3.43
BancBoston Capital/BancBoston Vent	8	18%	4.25
Opus Capital	11	14%	3.95
Associated Venture Investors	6	14%	2.87
Sequoia Capital	15	14%	4.51
Warburg Pincus LLC	14	13%	4.10
Integral Capital Partners	13	13%	3.88
Benchmark Capital Management	5	12%	2.21
Madison Dearborn Partners LLC	5	11%	2.19
Kleiner Perkins Caufield & Byers LLC	32	11%	5.31
Oak Investment Partners	13	10%	3.21

Similarly to the manager list, well-respected firms top the list of outperformance among investors. Matrix Partners had the highest ten-year annualized returns among its IPOs, while Kleiner Perkins Caufield & Byers earned the highest t-statistic due its higher number of IPOs brought to market. Chart 13 below highlights performance of investment firms versus the number of IPOs the firm has brought to market between 1993-2002.

Chart 13: Ten-Year Annualized Return (Market-Adjusted) by Investment Firm and # of IPOs (n=827 Investment Firms; 1705 IPOs)
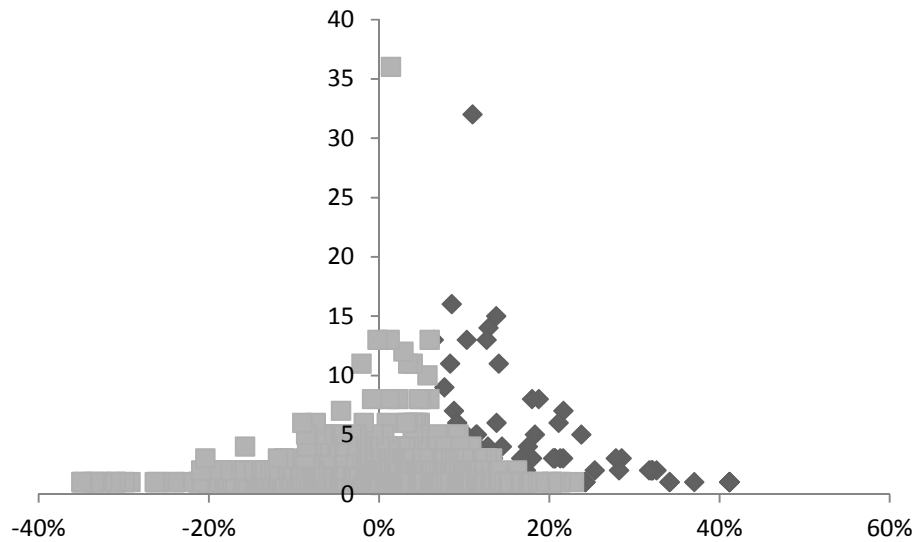
VI.3 Industry Effects

Another effect in outperformance may arise from outperformance of specific sectors. To examine this, I have grouped IPOs into industry sectors based on NAICS codes and a mapping used by Profs. Tambe and Saunders in their working paper "The Value of Data."[7] By doing so, we see that the majority of IPOs in the past twenty years have been among finance (including insurance), information (including software and services), and manufacturing (including communications equipment and biotech). Among these industries, information appears to show the best results, returning 7% annual returns over a ten-year period, versus 3% for finance and 4% for manufacturing. Further exploration to examine how the IPOs fared against their specific sectors instead of the S&P500 as a whole may shed further light onto industry effects on IPO returns.

Table 8: Annualized Return Above the S&P500 by Industry (Non-Survivor-Adjusted)

	# Firms	1	5	10	21	63	126	252	756	1260	2520
Accomodation and Food Services	47	-69%	-54%	-42%	-27%	1%	-13%	-10%	-13%	-4%	5%
Admin Services	21	-17%	-58%	-24%	-17%	0%	0%	-13%	-8%	-5%	-6%
Agriculture	89	10%	-56%	-52%	-34%	-21%	-17%	-17%	-6%	2%	10%
Arts, Recreation	71	763%	-68%	-63%	-36%	-10%	-16%	-11%	-3%	-5%	5%
Construction	34	-45%	11%	7%	2%	15%	-15%	-23%	-8%	-9%	3%
Education	36	-10%	39%	170%	30%	10%	12%	19%	22%	21%	26%
Finance	1,197	33%	-6%	-3%	-8%	-11%	-8%	-5%	-1%	-1%	3%
Healthcare	112	87%	-63%	-43%	-6%	2%	0%	-6%	-2%	-4%	-1%
Information	1,016	-13%	-10%	33%	80%	46%	16%	-3%	1%	2%	7%
Manufacturing	1,212	280%	1%	3%	41%	22%	0%	-6%	-4%	-1%	4%
Mining, Extraction	502	737%	12%	-9%	8%	18%	1%	-2%	0%	3%	6%
Professional Services	124	-8%	79%	60%	78%	30%	6%	-6%	6%	3%	5%
Real Estate	26	133%	-58%	-49%	-27%	-19%	-29%	-18%	-18%	-14%	
Retail	295	14%	-53%	-49%	-22%	-12%	-11%	-10%	0%	1%	8%
Transportation	367	-54%	-52%	-28%	5%	6%	-6%	-5%	-2%	-3%	2%
Utilities	80	600%	69%	50%	23%	10%	4%	5%	2%	7%	8%
Wholesale	137	-22%	-37%	-43%	-12%	-14%	-13%	-14%	-8%	-1%	5%

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[7] http://gsm.ucdavis.edu/sites/main/files/file-attachments/saunders_and_tambe_-_the_value_of_data.pdf

VI.3 Market Capitalization Effects

A final effect I will examine is that of initial market capitalization of public equity for an IPO. I have separated the 5,367 IPOs into five quintiles representing the initial market capitalization at the end of their first day of trading. Table 9 lists the criteria for each quintile.

Table 9: Maximum and Minimum Opening Market Capitalization Quintiles

Quintile	Minimum Opening Market Cap	Maximum Opening Market Cap
1	$1,000,000	$60,803,708
2	$541,685	$999,600
3	$355,614	$541,344
4	$255,761	$355,400
5	$0	$255,735

The largest IPO by market cap occurred in 2004 when the Chinese internet company TOM Online debuted on the NASDAQ, closing at a market cap of over $60B on its first day of trading. Table 12 shows the average annualized returns above the S&P500 by quintile. While in the very short term the top quintiles tend to outperform, there is no clear consistent outperformance across all holding periods. Further examination of size effects on IPOs may shed further light on this effect.

Table 10: Annualized Return Above the S&P500 by Market Cap Quintile (1=Largest Quintile), Survivor Adjusted

Quintile	Holding Period (Trading Days)									
	1	5	10	21	63	126	252	756	1260	2520
1	970.3%	-1.3%	3.6%	11.3%	6.4%	-4.7%	-3.0%	-3.1%	0.1%	0.9%
2	116.8%	16.6%	39.4%	29.8%	32.9%	3.6%	-1.4%	2.4%	0.9%	1.4%
3	308.3%	-7.8%	18.4%	61.1%	29.0%	7.9%	0.9%	-1.3%	-0.3%	0.1%
4	106.8%	-20.2%	0.7%	44.2%	30.6%	10.0%	-0.7%	0.0%	-0.6%	0.3%
5	6.1%	-23.8%	-17.0%	6.3%	3.2%	-4.1%	-7.6%	-5.3%	-3.8%	-0.6%

VII. FURTHER AREAS OF EXPLORATION

This analysis could be extended in several potential areas. They include, but are not limited to:

- Expanding the examination of manager effects on the performance of IPOs across different time periods

- Expanding the examination of investor effects on the performance of IPOs across different time periods

- Expanding the examination of industry effects on the performance of IPOs across different time periods

- Expanding the examination of issuer size or market capitalization effects on the performance of IPOs across different time periods

- Creating new investment strategies that value-weight the portfolio

- Analyzing the effect of restricting the time period on the "equal buy-in" strategy

- Analyzing the "rebalanced portfolio" strategy by buying into IPOs at different timing since launch (e.g. beginning in 1994 by buying 1993 IPOs one year after launch)

- Accounting for transaction costs (especially in the rebalancing portfolio)

- Accounting for risk-adjustment that may explain excess returns

VIII. CONCLUSION

This analysis has explored investment strategies for public equity investors in VC-backed IPOs and their relative performance to the market and other IPO types. While individual VC-backed IPOs tend to perform well in the first two weeks to three month holding periods, they tend to lag the market when held individually for any time one year or longer. However, a constantly rebalanced portfolio of VC-backed companies can take advantage both of the superior short-term performance and superior performance of "survivor" companies over the long-run. Thus, a rebalanced portfolio approach to investing in VC-backed IPOs appears to generate the best return for public equity investors against other types of IPOs, while handily beating the market.

The analysis also explored managerial and investor effects on IPO performance. While the results are preliminary, there appears to be a positive effect created by certain managers and investors – topping each of the lists were firms highly regarded in their respective industries.

Overall, there appear to be investible strategies for public investors to invest in VC-backed IPOs resulting in abnormal returns versus the market. While the topic warrants further exploration to ensure the returns are not driven by outsize risk or other potential factors to explain away the returns, this research suggests that not only insiders, but public investors as well, can benefit from the success of venture-backed companies.