

Aftermarket Performance of Private Equity Backed Companies

by

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Introduction

The Private Equity (PE) business model typically entails acquiring private or public firms, making operational improvements in these “portfolio companies”, and selling these businesses for a profit. A PE firm can exit its stake in a portfolio company either through an outright sale to another financial or strategic acquirer, or by publicly listing the portfolio company in a stock exchange through an Initial Public Offering (IPO). The PE compensation structure is usually composed of two elements – 1% to 2% of the amount invested in the fund (management fees) and 20% from the profits generated by the fund (performance fees). The higher weightage towards the performance fees provides a significant incentive for PE firms to sell businesses they acquire at a high premium to their purchase price, regardless of the choice of exit vehicle employed.

Once PE firms acquire companies, they “add value” to them through both financial and operational engineering. Understanding the financial engineering is intuitive – PE firms acquire equity stakes in companies, add leverage to the companies’ balance sheets, and can make a profit just by paying down the debt and selling the company in a few years (assuming the company’s operating performance stays the same). However, PE firms in recent years have had to acquire companies at higher multiples¹, which has rendered financial engineering inadequate to generate high returns. On the operating side, therefore, PE firms can distinguish themselves. “Value creation” at portfolio companies includes changes that include but are not limited to recapitalizations, cost reductions, management changes, and geographic expansion – which can boost PE returns significantly. The importance of having leading operational capabilities at PE

¹ Garrett James Black, “The current US private equity scene in 11 charts”,
<https://pitchbook.com/news/articles/the-current-us-private-equity-scene-in-11-charts>

firm is the primary reason that the role of PE “Operating Partners” has been on the rise². Overall, PE firms claim to make sustainable operational changes, which enable the companies they acquire to eventually compete effectively in the market.

PE firms are not held legally or financially responsible for a portfolio company’s performance (although to some extent they are held reputationally responsible) after they have exited their position in the company. This lack of post-exit accountability raises doubts about the nature of changes instituted by PE firms after they acquire a company. Critics question whether changes made by PE firms in these companies are sustainable, or if the operational and financial engineering is just part of elaborately dressing up the companies they own to fetch higher valuations when they sell these companies. Institutional Investor, a monthly periodical on investing, described the key flaw with the extant PE model as one that “prioritizes immediate profits, sometimes at the expense of long-term performance”. Put simply, “Private equity has a short-termism problem.”³

Criticism about the PE business model has not impeded the rapid growth of the industry. In March 2017, The Boston Consulting Group, a consulting firm, reported that in 2016 the total assets under management for the PE industry grew to nearly \$2.5 trillion, doubling in size over the preceding decade, and the number of PE firms grew to 4,719 from around 3,000 in 2006. The

² Axial, “The Rise of the Private Equity Operating Partner”, <https://www.axial.net/forum/the-rise-of-the-private-equity-operating-partner/>

³ Amy White, “Why Critics Are Slamming an Increasingly Popular Private Equity Format”, <https://www.institutionalinvestor.com/article/b15jkqt382wm4r/why-critics-are-slamming-an-increasingly-popular-private-equity-format>

same report also shared high satisfaction rates among investors with the PE asset class, with 95% of the investors affirming that PE had met or exceeded their expectations in 2016⁴. These results are not astonishing. Bain, another global consulting firm, in its 2018 Global Private Equity Report stated that as of mid-2017, “the median net return of PE holdings in the portfolios of public pension funds over a 10-year time horizon was 8.5%, compared with 4.2% for public equities, 4.5% for real estate investments, and 5.2% for fixed income.”⁵ The results were consistent across the United States, Europe, and Asia-Pacific for all PE buyout funds (does not include Venture Capital investments) from June 2007 to June 2017. The outperformance firstly highlights that on average, valuations of PE-backed companies have increased over time, allowing the funds that invested in them to achieve superior returns net of fees. The overall outperformance, however, also lends credence to the concerns of its critics – perhaps the excess returns of PE over other asset classes can be attributed to its ruthless pursuit of profits in the short-term, without any consideration for the long-term health of its portfolio companies.

This paper investigated whether the changes made by PE firms in its portfolio companies are truly sustainable and checked if claims made by critics about PE are unfounded. The paper analyzed only one mode of exit – public market IPOs of PE-backed companies, or PE backed IPOs. The relative performance of a publicly traded erstwhile PE-owned company was

⁴ Tawfik Hammoud, et al, “Capitalizing on the New Golden Age in Private Equity”,

<https://www.bcg.com/publications/2017/value-creation-strategy-capitalizing-on-new-golden-age-private-equity.aspx>

⁵ Hugh MacArthur, et al, “Global Private Equity Report 2018”,

http://www.bain.de/Images/BAIN_REPORT_2018_Private_Equity_Report.pdf

calculated by comparing the cumulative returns of the company to that of its “peer set”, a group of similar companies in the same industry, and to that of the market over different periods of time. The paper assumed that consistent underperformance of a PE-backed company would indicate that the PE owner likely instituted short-term changes in the company to boost its own return. Underperformance, in this context, was defined as the average cumulative returns over different time periods being statistically significantly lower than the average cumulative returns of the company’s peer set and the market indices. On the other hand, outperformance – statistically significantly higher average cumulative returns – would indicate that the changes made by PE owners were sustainable.

This research paper also explored how the number of years a company is held private and the size of its IPO affect its public market performance. PE firms have increasingly started holding companies for longer periods of time before exiting their positions⁶, purportedly to effect changes slowly and carefully. It follows that companies that have been under PE ownership longer should therefore perform better, and this research also checked whether the aftermarket performance of a company is positively related to the years the PE firm owned the company prior to exiting its stake. The size of the IPO is often determined, among other factors, by the number of years a company is held private. While acknowledging this relation, this research independently assessed whether the IPO size has any effect on a company’s long-term cumulative market performance. This research was limited to North American PE-backed IPOs listed on the New York Stock Exchange and the NASDAQ from 2000 to 2012.

⁶ Adam Lewis, “PE hold times keep going up”, <https://pitchbook.com/news/articles/pe-hold-times-keep-going-up>

Past Research and Literature Review

Significant research has been conducted on value creation by PE firms in the past few decades. The first seminal research work was undertaken by Jensen (1986), who underscored the importance of leverage, increased scrutiny, and management expertise to generate growth in private companies. Jensen (1989) shortly thereafter predicted that the leveraged buyout would become the supreme corporate organizational form, due to its focus on corporate governance, efficient capital allocation, significant managerial incentives, and having an optimal capital structure. The same year, Kaplan (1989) analyzed 76 large management buyouts from 1980 to 1986, and found that within three years of the buyout, companies consistently experienced increased operating incomes, decreased capital expenditures, and increased net cash flows “due to improved incentives rather than layoffs or managerial exploitation of shareholders through inside information” (Kaplan). Lichtenberg and Siegel (1990) assessed total factor productivity (TFP) in over 12,000 manufacturing plants from 1983 to 1986 and revealed that leveraged buyouts by PE firms had a strong positive effect on TFP.

Nearly two decades later, Lerner, et al (2008) investigated 495 buyouts and found that PE-backed companies do not appear to sacrifice long-term growth to boost short-term performance, using patenting activity as a proxy for innovation (a fundamentally long-term investment). Guo, et al (2011) conducted research on whether buyouts have continued to create value, highlighting how changes in the industry, such as lower leverage and increased asset restructuring during the holding period, from the 1980s have markedly affected performance. Guo’s research further underscored that the improvements in operating performance of PE-backed companies after being acquired are comparable to, if not slightly better than the operating performance of benchmarks. Acharya, et al (2013) analyzed UK PE deal data from entry to exit

and discovered that sales and operating margins of portfolio companies improve under PE owners, concluding that there was in fact a “positive impact of ownership by large, mature PE houses on the operating performance of portfolio companies, relative to that of the sector” (Acharya, et al).

The aftermarket performance of PE-backed IPOs has not been researched as extensively as the operating performance of PE-backed companies. Brav and Gompers (1997) were likely among the first researchers to compare the aftermarket performance of VC-backed IPOs to non-backed IPOs, discovering that the equal-weighted returns of VC-backed IPOs are higher than those of non-backed IPOs. Research then focused on pockets of PE-backed IPOs, such as the performance of Reverse Leveraged Buyouts (RLBOs) – public companies that were taken private and then taken public again. Cao and Lerner (2007), using a sample of about 500 RLBOs between 1980 and 2002, examined the three and five-year stock price performance of RLBOs. The research concluded that RLBOs consistently outperform other IPOs as well as the stock market with no evidence of deterioration of returns over time. In recent years, research conducted by Levis (2011) suggested that PE-backed IPOs listed in the London Stock Exchange from 1992 to 2005 performed better over 36 months than all other IPOs and the stock market on both equal-weighted and value-weighted terms. Levis attributed the outperformance to leverage, both before and after the company’s public market flotation.

This paper analyzes a previously un-researched dataset, of all North American PE-backed IPOs from 2000 to 2012 that have at least 5 years of stock history. The bulk of research done on the topic has focused on specific components of the PE industry –incentives set up for managers, patents filed by PE-backed companies, et al – or on whether companies under PE improve operationally. The papers that have researched aftermarket performance have not factored in

elements such as the number of years a company is held private or analyzed performance at the granular industry level. This paper hopes to fill in this gap by analyzing 797 IPOs across 9 distinct industries and assess performance both at the industry level and broadly as a group. Further, this paper independently assesses whether the aftermarket performance of PE-backed companies is affected by the time spent by PE owners in restructuring and reorganizing the company as well as the proceeds from the taking the company public.

Methodology

The research first required collecting a list of all PE-backed IPOs in in the two major American stock indices, NYSE and NASDAQ, from 2000 to 2012. The list of about 1,200 companies was obtained from Thomson Reuters SDC Platinum. The data included the company's IPO filing date, listing date, as well as information regarding the number of years the company was held private and the proceeds from its IPO. The industry categorization of each company was not listed. To compare the returns of every company to an industry benchmark, each company was therefore manually categorized under 9 commonly-used buckets: Natural Resources; Healthcare; Financials; Technology; Media; Communications; Industrials; Real Estate; and Consumer/ Retail. The buckets were selected primarily due to the existence of popular industry ETFs specific to the industries chosen. The companies were then scrubbed for bankruptcies and acquisitions within 5 years of the public listing, to facilitate apples-to-apples comparisons of the returns, which left a set of 797 PE-backed companies to analyze. Data on holding period returns was obtained from the Center for Research in Security Prices (CRSP)⁷ at the University of Chicago through the Wharton Research Database Service. Individual price streams were constructed for each company using monthly returns to calculate the 1-year, 3-year, and 5-year cumulative returns. The formula used to calculate the cumulative returns was:

$$CR_n = \frac{P_n - P_0}{P_0}$$

⁷ Calculated (or Derived) based on data from *NYSE/AMEX/NASDAQ Monthly Stock* ©2018 Center for Research in Security Prices (CRSP), The University of Chicago Booth School of Business

P_0 for every company was taken as \$100, and the price streams were calculated based on the monthly holding period returns ($R_1, R_2, \dots, R_{n-1}, R_n$). The ending price P_n for n periods was calculated as follows:

$$P_n = P_0 * (1 + R_1) * (1 + R_2) * \dots * (1 + R_{n-1}) * (1 + R_n)$$

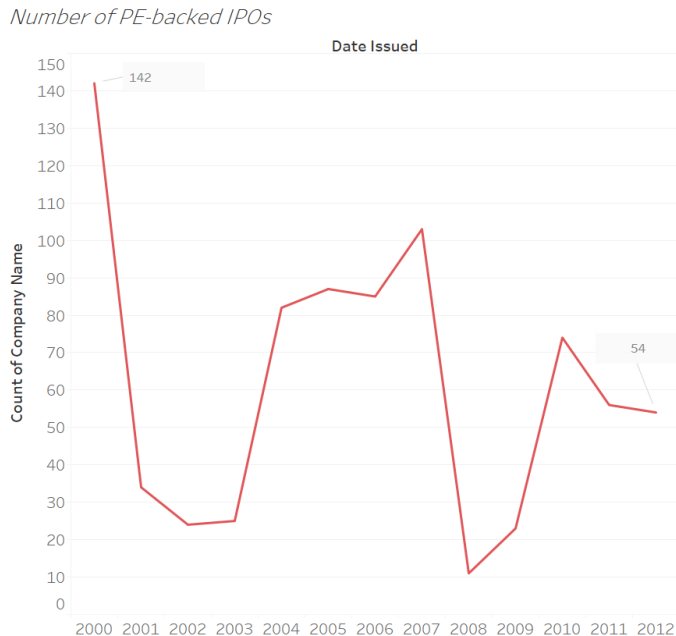
Price streams and cumulative returns were similarly constructed and calculated for the S&P 500, Russell 2000, and industry indices. The industry indices included exchange traded funds (ETFs) operated by State Street, Invesco, and BlackRock (Appendix 1). The excess returns over the S&P 500, Russell 2000, and the relevant industry index were calculated for each company, ensuring that the monthly returns were temporally matched.

To determine if the returns of the companies were statistically significantly different than the market and industry indices, 90 two-sample t -tests (Snedecor and Cochran, 1989) assuming unequal variances were performed. The test is used to determine if the means of two populations are equal – if the p -value of the test is below 0.05, then the null hypothesis that the two means are equal can be rejected. If the null hypothesis is rejected, a prediction interval allows us to determine which mean is greater than the other mean. A p -value above 0.05 signifies that the means are not statistically significantly different.

Further, to determine if the years a company is held private and if its size affect returns, univariate and multivariate regressions were performed on the whole data set for 1-year, 3-year, and 5-year returns. Regression allows us to determine whether any significant relation exists between different variables. If the p -values of the independent variables (predictors) is below 0.05, we can conclude that a relation does exist between the predictor and the dependent variable (response).

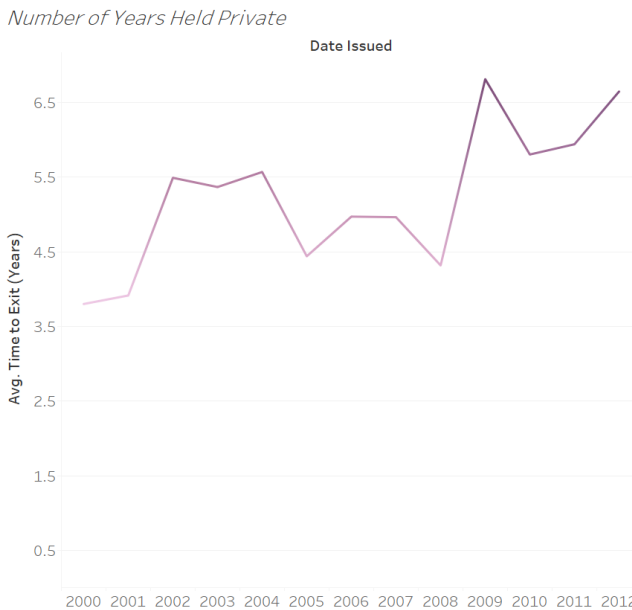
Results – Overview and Discussion

Data Overview



The number of PE-backed IPOs across all industries analyzed fell from 142 in 2000 to 54 in 2012. A dramatic decline in IPOs is visible during the dotcom bubble crash (2000-2001) and the global financial crisis (2008-09). This trend of fewer IPOs per year is consistent with the findings of Hogan Lovells, a law firm, which in 2016 reported that PE firms are increasingly

favoring buyouts of their portfolio companies over public market exits through IPOs⁸. The shift is attributed to the tepid state of the IPO markets, making public exits the “least financially appealing path to exit” (Glasser). Further, for the companies analyzed, the number of years PE owners held their portfolio companies

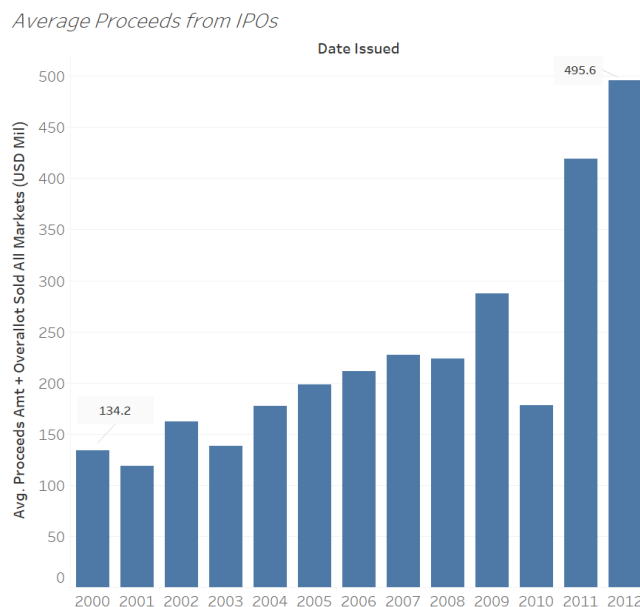


⁸ Michael Paul Glasser and Amanda Onions, “PE-Backed Buyouts Dominate Exits as IPOs

Languish”, <https://www.hoganlovells.com/blogs/the-buyout-board/pe-backed-buyouts-dominate-exits-as-ipos-languish>

private before taking them public increased dramatically, from an average of 3.8 years in 2000, to 6.8 years in 2012. A PitchBook 2017 report highlighted that the average PE hold period has increased to an average of 6.3 years in 2016 for all types of PE exits and not just public market exits.

Average proceeds from PE-backed IPOs have also increased during the time analyzed, from an average amount raised of \$134 million in 2000 to \$495.6 million in 2012.



I. Measuring Relative Performance

After constructing price streams and calculating the 1-year, 3-year, and 5-year returns for all companies and indices, the excess returns were calculated over the S&P 500, Russell 2000, and the relevant industry indices. The excess returns were then averaged for every year and are presented in the tables below. Table 1 shows the yearly average excess returns over the S&P 500 of PE-backed companies, Table 2 shows the yearly average excess returns over the Russell 2000 of PE-backed companies, and Table 3 shows the yearly average excess returns over the relevant industry indices (ETFs) of PE-backed companies. Appendix 2 includes the performance by industry against all the benchmarks.

Table 1: Relative Performance of PE-backed companies against S&P 500

Year	Number of IPOs	Years to Exit	Proceeds	Average Excess Returns over S&P 500		
				1 Yr	3 Yr	5 Yr
2000	141	3.83	\$ 134.24	(29.7%)	(23.9%)	(25.1%)
2001	34	3.91	\$ 118.35	10.1%	44.6%	60.1%
2002	24	5.49	\$ 161.82	21.1%	74.4%	55.8%
2003	25	5.37	\$ 138.31	(4.5%)	(10.4%)	(20.4%)
2004	82	5.57	\$ 177.65	10.6%	19.0%	12.8%
2005	86	4.49	\$ 198.02	30.0%	11.7%	19.1%
2006	85	4.97	\$ 211.46	24.3%	9.8%	31.8%
2007	102	5.01	\$ 227.60	(15.9%)	(5.3%)	(5.7%)
2008	11	4.32	\$ 223.94	10.3%	10.3%	8.8%
2009	23	6.81	\$ 287.11	8.2%	11.9%	13.9%
2010	74	5.80	\$ 177.91	(9.3%)	(5.6%)	3.8%
2011	56	5.94	\$ 418.91	(13.6%)	12.7%	(24.6%)
2012	54	6.65	\$ 495.62	25.0%	55.8%	65.3%

Table 2: Relative Performance of PE-backed companies against Russell 2000

Year	Number of IPOs	Years to Exit	Proceeds	Average Excess Returns over Russell 2000		
				1 Yr	3 Yr	5 Yr
2000	141	3.83	\$ 134.24	(43.4%)	(50.1%)	(77.9%)
2001	34	3.91	\$ 118.35	1.6%	11.6%	6.0%
2002	24	5.49	\$ 161.82	16.3%	48.4%	13.9%
2003	25	5.37	\$ 138.31	(10.8%)	(29.3%)	(38.0%)
2004	82	5.57	\$ 177.65	5.8%	11.6%	5.4%
2005	86	4.49	\$ 198.02	23.9%	6.3%	2.6%
2006	85	4.97	\$ 211.46	27.5%	8.3%	17.2%
2007	102	5.01	\$ 227.60	(16.9%)	(17.2%)	(22.2%)
2008	11	4.32	\$ 223.94	7.9%	(10.8%)	(20.3%)
2009	23	6.81	\$ 287.11	(4.8%)	(2.5%)	(13.0%)
2010	74	5.80	\$ 177.91	(12.8%)	(16.9%)	(3.3%)
2011	56	5.94	\$ 418.91	(9.5%)	12.0%	(20.4%)
2012	54	6.65	\$ 495.62	17.5%	48.1%	49.7%

Table 3: Relative Performance of PE-backed companies against Industry Indices

Year	Number of IPOs	Years to Exit	Proceeds	Average Excess Returns over Industry Benchmark		
				1 Yr	3 Yr	5 Yr
2000	141	3.83	\$ 134.24	(23.3%)	(24.9%)	(23.6%)
2001	34	3.91	\$ 118.35	4.4%	37.7%	46.0%
2002	24	5.49	\$ 161.82	19.1%	75.9%	54.8%
2003	25	5.37	\$ 138.31	(3.4%)	(11.3%)	(25.9%)
2004	82	5.57	\$ 177.65	11.0%	20.3%	3.6%
2005	86	4.49	\$ 198.02	28.7%	4.1%	4.7%
2006	85	4.97	\$ 211.46	20.8%	(1.9%)	9.6%
2007	102	5.01	\$ 227.60	(19.5%)	(16.4%)	(24.8%)
2008	11	4.32	\$ 223.94	3.3%	(5.4%)	(19.7%)
2009	23	6.81	\$ 287.11	2.7%	(4.7%)	(19.7%)
2010	74	5.80	\$ 177.91	(10.3%)	(12.0%)	(10.9%)
2011	56	5.94	\$ 418.91	(16.9%)	0.0%	(48.8%)
2012	54	6.65	\$ 495.62	25.6%	49.8%	50.0%

At first blush, the year in which a company is taken public seems to affect the direction of the relative performance. For instance, companies that were taken public in 2001-02, 2004-06, and 2012 consistently beat the market and industry indices on average across all periods measured. However, statistical tests in Appendix 3 showed that only exits in 2000 in fact underperformed almost all benchmarks. Indeed, the key research question was whether the aftermarket performance of PE-backed companies was statistically significantly different (better or worse) than its peers. For there to be statistically significant outperformance or underperformance, the p-value of a 2-sample t-test at a 95% confidence level needs to be below 0.05. P-values below 0.05 are investigated to determine the direction of the difference – a positive result would indicate outperformance, while a negative return would indicate underperformance. The two-sample t-test was performed for all the 1-year, 3-year, and 5-year stock returns against the two market indices. No p-value was below 0.05, which indicates that the

results were not statistically significant. In other words, the entire set of PE-backed companies did not underperform or outperform any index consistently.

The overall data set could be masking industry-level differences in performance. To assess the performance of specific industries, two-sample t-tests were performed on the sorted sample of companies.

Table 4: 2-sample t-test for all companies

The 1-year, 3-year, and 5-year performance of the companies were tested against the market indices and their respective industry indices. The results from this analysis indicated that there is no statistically significant difference

Returns	Benchmark	p value
1 Year	S&P 500	0.663
1 Year	Russell 2000	0.14
3 Year	S&P 500	0.205
3 Year	Russell 2000	0.448
5 Year	S&P 500	0.321
5 Year	Russell 2000	0.087

in the performance of the industries for most periods. The notable exception is the Communications industry, which has consistently underperformed all benchmarks in all periods.

Table 5: 2-sample t-test results by industry

2-sample t-test	S&P 500			Russell 2000			Industry Index		
	1 Yr	3 Yr	5 Yr	1 Yr	3 Yr	5 Yr	1 Yr	3 Yr	5 Yr
<i>p-values</i>									
Technology	0.183	0.178	0.123	0.016	0.824	0.867	0.908	0.101	0.294
Industrials	0.975	0.959	0.711	0.502	0.251	0.071	0.445	0.298	0.071
Healthcare	0.916	0.272	0.850	0.240	0.647	0.099	0.293	0.565	0.104
Media	0.676	0.165	0.056	0.474	0.033	0.003	0.084	0.050	0.043
Consumer	0.024	0.238	0.245	0.135	0.948	0.797	0.091	0.957	0.407
Natural Resources	0.067	0.218	0.253	0.166	0.709	0.926	0.612	0.634	0.563
Communications	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.003
Real Estate	0.746	0.286	0.860	0.868	0.343	0.998	0.975	0.409	0.856
Financials	0.052	0.043	0.196	0.108	0.145	0.363	0.026	0.019	0.095

In Table 5, cells highlighted in green – Consumer 1-year returns against S&P 500, Financials 3-year returns against S&P 500 and the Industry index, and Financials 1-year returns against the industry index – have demonstrated statistically significant outperformance. The cells

highlighted in red – Technology 1-year returns against Russell 2000, Media 3-year returns against the Russell 2000 and Industry index, Media 5-year returns against the Russell 2000 and Industry index, and all Communications returns – have demonstrated statistically significant underperformance. The results of the 2-sample *t*-tests by year can be found in Appendix 3.

II. Key Performance Drivers

For the 797 PE-backed companies analyzed, regressions of the 1-year, 3-year, and 5-year cumulative returns were performed against the years the company was held private and the proceeds received from the IPO. Regressions are helpful to measure whether one or more independent variables (predictors) can predict the value of a dependent variable (response). A good regression model has two key components – (1) a low p-value (<0.05) for the predictor(s), which indicates that we can reject the null hypothesis (that the means are equal in a two-sample test), and (2) a high r-squared, which means that most of the variability in the data can be explained by the model obtained through the regression. The results of the regression conducted are discussed below:

1) 1-Year Returns vs. Time to Exit

Regression Analysis: Stock 1 Yr versus Time to Exit (Years)						
Method						
Rows unused	3					
Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression	1	4.136	4.1361	9.32	0.002	
Time to Exit (Years)	1	4.136	4.1361	9.32	0.002	
Error	795	352.772	0.4437			
Lack-of-Fit	144	62.32	0.4328	0.97	0.581	
Pure Error	651	290.452	0.4462			
Total	796	356.908				
Model Summary						
S	R-sq	R-sq(adj)	R-sq(pred)			
	0.666137	1.16%	1.03%	0.68%		
Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	-0.0937	0.0399	-2.35	0.019		
Time to Exit (Years)	0.01934	0.00634	3.05	0.002	1	
Regression Equation						
Stock 1 Yr	=	-0.0937 + 0.01934 Time to Exit (Years)				

The regression indicated a statistically significant relationship (p-value of coefficient = 0.002) between the returns (response) and the time to exit (predictor). For the data analyzed, every

additional year a PE-backed company is held private increases its 1-Year Stock Performance by 1.93%. The model however has low predictive power (r-squared is approximately 1%).

2) 3-Year Returns vs. Time to Exit

Regression Analysis: Stock 3 Yr versus Time to Exit (Years)						
Method						
Rows unused	3					
Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression	1	10.05	10.051	7.42	0.007	
Time to Exit (Years)	1	10.05	10.051	7.42	0.007	
Error	795	1076.51	1.354			
Lack-of-Fit	144	174.64	1.213	0.88	0.836	
Pure Error	651	901.86	1.385			
Total	796	1086.56				
Model Summary						
S	R-sq	R-sq(adj)	R-sq(pred)			
	1.16366	0.93%	0.80%	0.45%		
Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	-0.0232	0.0696	-0.33	0.739		
Time to Exit (Years)	0.0302	0.0111	2.72	0.007	1	
Regression Equation						
Stock 3 Yr	=	-0.0232 + 0.0302 Time to Exit (Years)				
Fits and Diagnostics for Unusual Observations						

This regression also indicated a statistically significant relationship (p-value of coefficient = 0.007) between the returns (response) and the time to exit (predictor). For the data analyzed, every additional year a PE-backed company is held

private increases its 3-Year Stock Performance by 3.02%. The model however has low predictive power (r-squared is less than 1%).

3) 5-Year Returns vs. Time to Exit

Regression Analysis: Stock 5 YR versus Time to Exit (Years)						
Method						
Rows unused	3					
Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression	1	23.83	23.833	7.78	0.005	
Time to Exit (Years)	1	23.83	23.833	7.78	0.005	
Error	795	2434.57	3.062			
Lack-of-Fit	144	588.25	4.085	1.44	0.002	
Pure Error	651	1846.32	2.836			
Total	796	2458.4				
Model Summary						
S	R-sq	R-sq(adj)	R-sq(pred)			
	1.74996	0.97%	0.84%	0.44%		
Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	0.006	0.105	0.06	0.954		
Time to Exit (Years)	0.0464	0.0166	2.79	0.005	1	
Regression Equation						
Stock 5 YR	=	0.006 + 0.0464 Time to Exit (Years)				

The final time to exit univariate regression also indicated a statistically significant relationship (p-value of coefficient = 0.005) between the returns (response) and the time to exit (predictor). For the data analyzed, every additional year a PE-backed company is held

private increases its 5-Year Stock Performance by 4.64%. The model however has low predictive power (r-squared is less than 1%).

4) 1-Year Returns vs. Amt of IPO Proceeds

Regression Analysis: Stock 1 Yr versus Proceeds Amt + ... erallot Sold A						
Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression	1	0.002	0.0019	0	0.948	
Proceeds Amt + Overallot Sc	1	0.002	0.0019	0	0.948	
Error	798	357.977	0.44859			
Lack-of-Fit	638	302.32	0.47386	1.36	0.009	
Pure Error	160	55.657	0.34786			
Total	799	357.979				
Model Summary						
S	R-sq	R-sq(adj)	R-sq(pred)			
	0.66977	0.00%	0.00%	0.00%		
Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	0.003	0.0251	0.12	0.904		
Proceeds Amt + Overallot Sol	-0.000002	3.8E-05	-0.07	0.948		1
Regression Equation						
Stock 1 Yr	=	0.0030 - 0.000002 Proceeds Amt				

The univariate regression of 1-year stock returns (response) against the proceeds from the IPO (predictor) did not yield any statistically significant relationship (p value = 0.948).

5) 3-Year Returns vs. Amt of IPO Proceeds

Regression Analysis: Stock 3 Yr versus Proceeds Amt + ... rallot Sold A						
Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression	1	3.2	3.2	2.35	0.125	
Proceeds Amt + Overallot Sc	1	3.2	3.2	2.35	0.125	
Error	798	1085.03	1.36			
Lack-of-Fit	638	814.74	1.277	0.76	0.99	
Pure Error	160	270.29	1.689			
Total	799	1088.23				
Model Summary						
S	R-sq	R-sq(adj)	R-sq(pred)			
	1.16605	0.29%	0.17%	0.00%		
Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	0.105	0.0437	2.4	0.016		
Proceeds Amt + Overallot Sol	0.0001	6.5E-05	1.53	0.125		1
Regression Equation						
Stock 3 Yr	=	0.1050 + 0.000100 Proceeds Amt				

The regression of the 3-year stock returns (response) against the proceeds from the IPO (predictor) also did not yield any statistically significant relationship (p value = 0.125).

6) 5-Year Returns vs. Amt of IPO Proceeds

Regression Analysis: Stock 5 YR versus Proceeds Amt + ... rallo Sold A						
Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression		1	15.98	15.978	5.22	0.023
Proceeds Amt + Overallot Sc		1	15.98	15.978	5.22	0.023
Error		798	2444.35	3.063		
Lack-of-Fit		638	2230.15	3.496	2.61	0
Pure Error		160	214.21	1.339		
Total		799	2460.33			
Model Summary						
S	R-sq	R-sq(adj)	R-sq(pred)			
	1.75017	0.65%	0.52%	0.27%		
Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	0.1892	0.0655	2.89	0.004		
Proceeds Amt + Overallot Sol	0.000224	9.8E-05	2.28	0.023		1
Regression Equation						
Stock 5 YR	=	0.1892 + 0.000224 Proceeds Amt				

The 5-year stock returns (response) has a statistically significant relationship with the IPO proceeds (predictor) in the univariate regression (p value = 0.023). For the data analyzed, every additional

\$100 million raised increases the 5-year stock returns by 2.24%. The model however has poor predictive power (r-squared less than 1%).

7) 1 Year>Returns vs. Time to Exit and Amt. of IPO Proceeds

Regression Analysis: Stock 1 Yr versus Time to Exit ... Overallot Sold A						
Method						
Rows unused		3				
Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression		2	4.145	2.07231	4.66	0.01
Time to Exit (Years)		1	4.143	4.14312	9.33	0.002
Proceeds Amt + Overallot Sc		1	0.008	0.00849	0.02	0.89
Error		794	352.764	0.44429		
Lack-of-Fit		790	351.094	0.44442	1.06	0.56
Pure Error		4	1.67	0.41758		
Total		796	356.908			
Model Summary						
S	R-sq	R-sq(adj)	R-sq(pred)			
	0.666549	1.16%	0.91%	0.53%		
Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	-0.0927	0.0406	-2.29	0.023		
Time to Exit (Years)	0.01937	0.00634	3.05	0.002		1
Proceeds Amt + Overallot Sol	-0.000005	3.7E-05	-0.14	0.89		1
Regression Equation						
Stock 1 Yr	=	-0.0927 + 0.01937 Time to Exit (Years)				
		- 0.000005 Proceeds Amt + Overallot Sold A				

The multivariate regression does not yield statistically significant results for both variables (p-value of Proceeds is 0.89) despite a strong relationship with Predictor 1 (time to exit, p value = 0.002). The model is not useful.

8) 3-Year Returns vs. Time to Exit and Amt. of IPO Proceeds

Regression Analysis: Stock 3 Yr versus Time to Exit ... Overallot Sold A					
Method					
Rows unused	3				
Analysis of Variance					
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	13.04	6.5181	4.82	0.008
Time to Exit (Years)	1	9.76	9.7583	7.22	0.007
Proceeds Amt + Overallot Sc	1	2.99	2.9856	2.21	0.138
Error	794	1073.52	1.352		
Lack-of-Fit	790	1073.08	1.3583	12.42	0.012
Pure Error	4	0.44	0.1093		
Total	796	1086.56			
Model Summary					
S	R-sq	R-sq(adj)	R-sq(pred)		
	1.16277	1.20%	0.95%	0.68%	
Coefficients					
Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-0.0422	0.0707	-0.6	0.551	
Time to Exit (Years)	0.0297	0.0111	2.69	0.007	1
Proceeds Amt + Overallot Sol	0.000097	6.5E-05	1.49	0.138	1
Regression Equation					
Stock 3 Yr	=	-0.0422 + 0.0297 Time to Exit (Years) + 0.000097 Proceeds Amt			

The multivariate regression does not yield statistically significant results for both variables (p-value of Proceeds is 0.89), despite a strong relationship with Predictor 1 (time to exit, p value = 0.007). The model is not useful.

9) 5-Year Returns vs. Time to Exit and Amt. of IPO Proceeds

Regression Analysis: Stock 5 YR versus Time to Exit ... Overallot Sold A					
Method					
Rows unused	3				
Analysis of Variance					
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	39.02	19.5098	6.4	0.002
Time to Exit (Years)	1	22.83	22.828	7.49	0.006
Proceeds Amt + Overallot Sc	1	15.19	15.1869	4.98	0.026
Error	794	2419.38	3.0471		
Lack-of-Fit	790	2418.28	3.0611	11.12	0.014
Pure Error	4	1.1	0.2753		
Total	796	2458.4			
Model Summary					
S	R-sq	R-sq(adj)	R-sq(pred)		
	1.74559	1.59%	1.34%	0.93%	
Coefficients					
Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-0.037	0.106	-0.35	0.728	
Time to Exit (Years)	0.0455	0.0166	2.74	0.006	1
Proceeds Amt + Overallot Sol	0.000219	9.8E-05	2.23	0.026	1
Regression Equation					
Stock 5 YR	=	-0.037 + 0.0455 Time to Exit (Years) + 0.000219 Proceeds Amt			

The multivariate regression yields a statistically significant relationship between the 5-Year Returns (response), the time to exit (predictor 1, p value = 0.006), and the amount of IPO proceeds (predictor 2, p value = 0.026). For the data analyzed, every additional year a company is kept private increases 5-year

returns by 4.55% and every \$100 million raised increases 5-year returns by 2.19%. The predictive power of the model continues to remain low (slightly above 1%).

Conclusion and Implications

After analyzing the aftermarket performance of 797 North American PE-backed companies from 2000 to 2012, this paper discovered that most PE-backed companies neither underperform nor outperform their peers from a cumulative returns perspective. Of the whole sample, only PE-backed companies in the Communications sector were found to consistently underperform market and industry indices. As such, criticism regarding the unsustainability of changes instituted by PE owners appears unfounded. Some PE investors seek out and acquire poorly run businesses. Specifically, for these PE-backed companies, performing in line with market and industry indices is an improvement to their pre-PE-ownership relative underperformance.

This research also explored whether the number of years PE firms hold companies private affects returns and discovered that there is a significant positive relationship between the two variables. Every additional year a company is held private increases its 1-year cumulative returns by 1.93%, its 3-year cumulative returns by 3.02%, and its 5-year cumulative returns by 4.64%. The improved aftermarket performance from increasing holding periods provides some evidence that operational changes by PE firms that are patiently made have a longer lasting impact. Holding companies longer would in turn help PE firms grow the size of the portfolio companies as well, which bodes well for the company's long-term performance. The research indicated that every additional hundred million dollars raised by PE-backed companies while IPO-ing increased their 5-year cumulative returns by 2.24%.

The PE industry constantly refines its business model. In recent years, some PE firms have opted not to monetize their investment (sell their stake) in portfolio companies even after an

IPO, as they see opportunities for further growth. An example of this model in action is Hellman and Friedman's (H&F) investment in Scout24, a leading European internet classifieds company, in 2014⁹. H&F worked with operating partners to operationally optimize Scout24 (including divesting non-strategic units), led the company's IPO in 2015, but only fully exited its stake in 2018. For such cases, the findings of this research are particularly relevant – specifically the relation between the years to exit and the aftermarket performance of companies – since the PE firms' interests in the aftermarket performance of the stock would be fully aligned with that of other stockholders. Other similar transactions include KKR's investment in FirstData and Warburg Pincus' investment in Laredo Petroleum.

This research suffers from “survivorship bias” since it screens out PE-backed companies that were acquired or went bankrupt within 5 years of their IPO. To facilitate an apples-to-apples comparison, only companies that had at least 5 years of public market history were analyzed. However, this comparison led to the elimination of nearly 400 companies. No other constraint beyond the 5-year history requirement was set for screening the companies. The list of PE-backed IPOs from Thomson Reuters also included a few VC / Growth Equity backed companies that had minority PE owners, which could have slightly affected the analysis. Further, the PE-backed IPOs could perhaps have shared similar returns profiles as other IPOs during the same period, although this would be a more significant concern if there was any evidence of under/out performance.

There are several possible extensions to this research. The data did not account for differences in the extent of portfolio company ownership by the PE firms. There are several

⁹ Scout24, Hellman & Friedman, <http://hf.com/portfolio/scout24-holding-gmbh/>

possible forms of ownership by PE firms, including full ownership, majority ownership, and minority ownership. The varying degrees of control associated with these levels in turn could affect the nature and extent of operational changes instituted. The research could also have assessed metrics beyond the cumulative returns, such as improvements in gross and operating margins, free cash flows, and return on capital employed. Assessing the aftermarket performance of the portfolio companies of specific funds would also be extremely interesting and serve as a yardstick to measure the operational capabilities of PE firms. Further, researching whether co-investing yields different operational results and aftermarket performance for portfolio companies compared to individually investing would also be fascinating to explore.

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Appendix 1 – Industry Indices Used

- 1) Technology: Technology Select Sector SPDR® Fund, State Street Global Advisors,
Ticker: XLK, Inception Date: 12/16/1998
- 2) Industrials: Industrial Select Sector SPDR® Fund, State Street Global Advisors, Ticker:
XLI, Inception Date: 12/16/1998
- 3) Healthcare: Health Care Select Sector SPDR® Fund, State Street Global Advisors,
Ticker: XLV, Inception Date: 12/16/1998
- 4) Media: Used the PBS index from 2005, and a hand-constructed index prior -
 - a) PBS - PowerShares Dynamic Media Portfolio, Invesco, Ticker: PBS, Inception Date:
06/23/2005
 - b) Custom index comprised of CBS Corp (CBS), Dish Network Corporation (DISH),
Sinclair Broadcast Group (SBGI), The New York Times Company (NYT), and Comcast
(CMCSA)
- 5) Consumer: Equally weighted portfolio comprised of:
 - a) Consumer Staples Select Sector SPDR® Fund, State Street Global Advisors, Ticker:
XLP, Inception Date: 12/16/1998
 - b) Consumer Discretionary Select Sector SPDR® Fund, State Street Global Advisors,
Ticker: XLY, Inception Date: 12/16/1998
- 6) Natural Resources: Used a North American Natural Resources index from 2001, and an
Energy index prior:
 - a) iShares North American Natural Resources ETF, iShares by BlackRock, Ticker: IGE,
Inception Date: 10/22/2001

- b) Energy Select Sector SPDR® Fund, State Street Global Advisors, Ticker: XLE,
Inception Date: 12/16/1998
- 7) Real Estate: iShares U.S. Real Estate ETF, iShares by BlackRock, Ticker: IYR, Inception
Date: 06/12/2000
- 8) Communications: Used the Telecom index from May 2000, and a hand-constructed index
prior –
 - a) iShares U.S. Telecommunications ETF, iShares by BlackRock, Ticker: IYZ,
Inception Date: 05/22/2000
 - b) Custom index comprised of AT&T Corporation (T), Century Link (CTL), Verizon
(VZ), and Cisco (CSCO).
- 9) Financials: Financial Select Sector SPDR® Fund, State Street Global Advisors, Ticker:
XLF, Date: 12/16/1998

Appendix 2 – Performance by Industry

<i>Industry</i>	<i>Number of IPOs</i>	<i>Years to Exit</i>	<i>Proceeds</i>	<i>Average Excess Returns over S&P 500</i>		
				<i>1 Yr</i>	<i>3 Yr</i>	<i>5 Yr</i>
Technology	196	5.46	249.89	(7%)	12%	22%
Industrials	66	5.00	251.42	0%	(1%)	(5%)
Healthcare	202	5.59	120.58	0%	11%	3%
Consumer	105	4.88	211.55	5%	14%	17%
Financials	51	4.54	239.50	22%	36%	48%
Media	33	4.61	292.44	(6%)	(23%)	(32%)
Natural Resources	85	3.88	311.68	13%	14%	20%
Communications	50	5.03	233.22	(31%)	(45%)	(45%)
Real Estate	9	3.84	363.48	7%	38%	5%

<i>Industry</i>	<i>Number of IPOs</i>	<i>Years to Exit</i>	<i>Proceeds</i>	<i>Average Excess Returns over Russell 2000</i>		
				<i>1 Yr</i>	<i>3 Yr</i>	<i>5 Yr</i>
Technology	196	5.46	249.89	(13%)	(2%)	(2%)
Industrials	66	5.00	251.42	(5%)	(13%)	(26%)
Healthcare	202	5.59	120.58	(5%)	(5%)	(24%)
Consumer	105	4.88	211.55	1%	1%	(4%)
Financials	51	4.54	239.50	18%	26%	33%
Media	33	4.61	292.44	(10%)	(35%)	(52%)
Natural Resources	85	3.88	311.68	10%	4%	2%
Communications	50	5.03	233.22	(36%)	(57%)	(71%)
Real Estate	9	3.84	363.48	4%	63%	0%

<i>Industry</i>	<i>Number of IPOs</i>	<i>Years to Exit</i>	<i>Proceeds</i>	<i>Average Excess Returns over Industry Indices</i>		
				<i>1 Yr</i>	<i>3 Yr</i>	<i>5 Yr</i>
Technology	196	5.46	249.89	1%	15%	15%
Industrials	66	5.00	251.42	(6%)	(11%)	(26%)
Healthcare	202	5.59	120.58	(5%)	(6%)	(24%)
Consumer	105	4.88	211.55	1%	1%	-9%
Financials	51	4.54	239.50	25%	43%	63%
Media	33	4.61	292.44	(3%)	(34%)	(36%)
Natural Resources	85	3.88	311.68	4%	6%	10%
Communications	50	5.03	233.22	(25%)	(39%)	(35%)
Real Estate	9	3.84	363.48	1%	55%	9%

Appendix 3 – 2-sample *t*-tests by year

2-sample <i>t</i> -test <i>p</i> -values	S&P 500			Russell 2000			Industry Index		
	1 Yr	3 Yr	5 Yr	1 Yr	3 Yr	5 Yr	1 Yr	3 Yr	5 Yr
2000	0.000	0.000	0.049	0.000	0.000	0.000	0.000	0.000	0.079
2001	0.650	0.058	0.135	0.689	0.328	0.546	0.605	0.056	0.123
2002	0.327	0.132	0.574	0.158	0.016	0.355	0.258	0.015	0.368
2003	0.550	0.336	0.263	0.395	0.084	0.105	0.695	0.346	0.254
2004	0.308	0.453	0.235	0.277	0.276	0.494	0.122	0.181	0.776
2005	0.003	0.164	0.247	0.001	0.454	0.711	0.000	0.681	0.641
2006	0.010	0.393	0.059	0.001	0.302	0.142	0.007	0.949	0.336
2007	0.001	0.253	0.321	0.000	0.015	0.074	0.000	0.017	0.058
2008	0.768	0.516	0.879	0.591	0.789	0.744	0.760	0.917	0.730
2009	0.885	0.903	0.677	0.934	0.933	0.847	0.926	0.947	0.649
2010	0.437	0.966	0.739	0.111	0.315	0.944	0.202	0.488	0.844
2011	0.020	0.666	0.446	0.085	0.628	0.402	0.018	0.928	0.112
2012	0.044	0.015	0.03	0.064	0.03	0.105	0.018	0.031	0.121