



Properties of Capital Draws in Private Equity Funds

Andrew Conner, CFA

Alignment Capital Group
6615 Vaught Ranch Road
Suite #101
Austin, TX 78730
512-744-4458 (Phone)
512-744-4496 (Fax)
www.alignmentcapital.com

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INTRODUCTION

Understanding cash flows is an essential component of managing a private equity program. Unlike traditional equity asset classes, private equity investments draw capital and distribute value over time, eventually liquidating entirely. Understanding expected cash flows from a statistical perspective allows investors to manage cash allocations and design a program that maintains its desired exposure to private equity over time.

In this research brief we examine the characteristics of capital drawdowns in private equity funds. We observe the fund lifecycle and note that the age of a fund is a key determinant of expected drawdowns. We find that private equity funds tend to invest nearly all of their capital within their investment periods and suggest that General Partners may adapt their behavior in order to do so. Finally, we ask whether there is an overarching industry effect, which is dependent upon the current economic environment, that influences the amount of capital drawn in a given year by all funds.

DATASET

In this brief, we analyzed the funds in the Venture Economics database. Our dataset includes all venture capital, leveraged buyout, and mezzanine debt funds in the database from vintage years 1980-2003. After calculating each fund's total capital draws as a proportion of committed capital, we removed 22 funds from the sample that invested over 150% of their commitments. These funds are most likely "Evergreen Funds," which recycle capital and exhibit irregular takedown patterns that could skew our results. After removing these funds our dataset included a total of 1,622 funds.

METHODOLOGY

We evaluated the cross-sectional statistical distributions of annual capital drawdowns of all funds in our sample, grouped by fund age. We scaled all cash flows from each fund by dividing them by the fund's total committed capital, so that larger funds would not be disproportionately represented in our calculations of expected draws. For each fund, we examined ten years of drawdowns, with a fully invested fund's draws approaching 1.0. The first year included the sum of cash draws that occurred within the calendar year equal to the fund's vintage year, as specified by Venture Economics. So, as an



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example, for a fund from vintage year 1980 year one would be 1980 and year ten would be 1989.

After grouping cash flows by fund age, we calculated several descriptive statistics from the distribution of annual drawdowns at each point of the fund lifecycle. We measured the mean of annual draws, the variance, skewness, and kurtosis, in order to gain a sense of the location and shape of the distributions.

We then studied the statistical distributions of cumulative drawdowns at each fund age. By calculating the cumulative drawdowns at each point in the fund lifecycle, we were able to draw conclusions regarding the conditional variance of a particular fund's annual drawdowns given that fund's prior total drawdowns.

Given the characteristics of the statistical distributions of annual periodic and cumulative drawdowns, we were able to estimate expected draws for each fund age. Having done this, we back-tested each fund against expected draws, observing whether the average deviation from that expectation held any relation to the calendar years of the observation period. For instance, we asked whether all existing funds, regardless of their age, in the year 1990 were more likely to have an above-average draw (or below-average draw) in that year, due to the economic environment that existed in 1990.

RESULTS

After calculating the summary statistics of the distributions of annual capital draws by fund age, it was clear that a fund's age was a primary determinant of the amount of capital it drew in a given year. Exhibit 1 contains several statistics that describe the distributions of annual drawdowns. Note that the number of funds in the sample decreases each year because recent vintage years begin to fall out of the dataset.

Exhibit 1: Summary Statistics of Annual Capital Draws per Dollar Committed, By Fund Age

Fund Age (Years)	1	2	3	4	5	6	7	8	9	10
Number of Funds (n)	1622	1611	1584	1502	1338	1184	1043	938	865	795
Average Annual Draw	0.22	0.22	0.18	0.12	0.07	0.04	0.02	0.01	0.00	0.00
Variance	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Skewness	1.9	0.9	0.7	1.0	1.7	2.7	1.1	11.6	9.2	8.8
Kurtosis	7.7	4.4	3.5	3.9	6.6	13.1	33.9	183.7	105.9	95.0
Probability Equals Zero	5%	12%	17%	30%	46%	60%	74%	85%	90%	93%

Source: Alignment Capital Group and Venture Economics



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On average, over 62% of a fund's committed capital was drawn in the first three years. Less than 3% of commitments were drawn after year six, and in each year after year five a majority of the funds in the sample drew no capital. This was not surprising given that the contractual investment period for funds is typically five or six years.

The variance of capital draws was highest in the first year. This dispersion can be explained by potential downside or upside variability depending upon the timing of the fund's close. Funds that close late in their vintage year may be more likely to draw below average amounts of capital in remaining months of that calendar year. Alternatively, funds that close early in the year or those that have warehoused portfolio company investments prior to closing may draw above average amounts of capital in the first year. After the first year the variance of annual takedowns decreased each year. In every year the distribution of capital draws was skewed positively, perhaps because takedowns are largely truncated at zero, and long-tailed (indicated by kurtosis greater than 3), suggesting that there were outlier funds that drew a large proportion of capital in one year.

After calculating the same summary statistics, but grouping separately venture capital and leveraged buyout and mezzanine funds (not shown), it was clear that the sub-asset classes are statistically very similar to one another with respect to capital drawdowns.

Examining the distribution of each year's cumulative drawdowns reveals some additional information. Exhibit 2 contains summary statistics associated with the distributions of cumulative capital drawn as of each year in the fund lifecycle.

Exhibit 2: Summary Statistics of Cumulative Capital Draws per Dollar Committed, By Fund Age

Fund Age (Years)	1	2	3	4	5	6	7	8	9	10
Number of Funds (n)	1622	1611	1584	1502	1338	1184	1043	938	865	795
Average Cumulative Draw	0.22	0.44	0.62	0.75	0.84	0.89	0.92	0.93	0.94	0.94
Variance	0.04	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.03
Correlation with Subsequent Draw	-0.07	-0.23	-0.34	-0.32	-0.26	-0.21	-0.25	-0.06	-0.04	

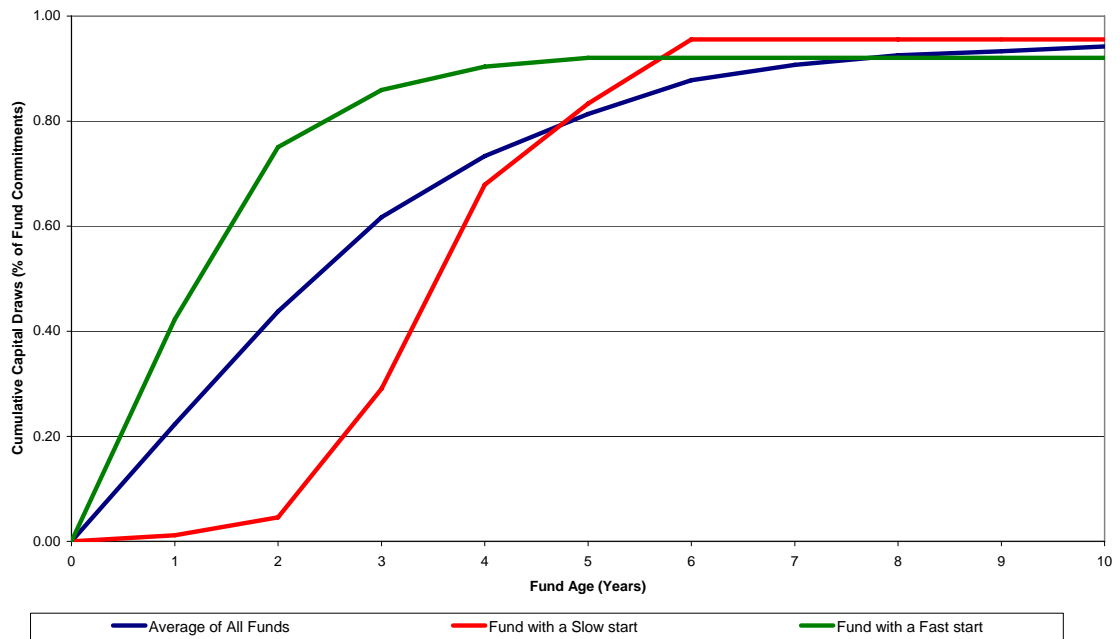
Source: Alignment Capital Group and Venture Economics

After the second year, the variance of the cumulative draws was less than the sum of the variances of annual draws, which are shown in Exhibit 1. The cumulative variance would equal the sum of the annual variances in the case that annual drawdowns were serially independent. The negative correlation between the cumulative draws and the subsequent period's annual draws shown in the last row of Exhibit 2 (which are statistically significant with greater than 99% confidence through year eight) confirms empirically that cumulative capital draws are mean reverting.

The presence of mean reversion in capital draws supports the notion that General Partners tend to invest the majority of their committed capital within the investment period. Typically there is a contractual prohibition on investing more than 100% of commitments. At the same time General Partners have an economic incentive, in order to maximize expected carried interest, to invest as much committed capital as possible.

Exhibit 3 is a graphical example of the mean reverting nature of capital draws. The graph contains fund age in years on the x-axis and cumulative capital drawn on the y-axis.

Exhibit 3: Example of Mean Reversion in Capital Draws



Source: Alignment Capital Group and Venture Economics

The blue line in Exhibit 3 represents the mean of cumulative drawdowns for all funds in the sample. As described above, a majority of the capital was invested in the first three years, leveling off after year six. The red and green lines show two particular funds from the sample; one that began deploying capital slowly and one that began more rapidly. Both ultimately drew an amount of capital close to the expected value by the end of year ten.

The red line represents the draws of a vintage year 1997 venture capital fund selected from the data set. This fund drew very little capital in the first two years and lagged the



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average, shown by the blue line, through year four. This could have been symptomatic of a relative lack of attractive investment opportunities early in the fund's life. However, in the third through the sixth years of the fund's investment period it drew more capital than average, effectively "catching-up" by year five and ensuring that it would invest a majority of its capital. This accelerated investment pace was most likely aided by the flourishing venture capital markets of 1999 and 2000.

The green line represents the capital drawn by a 1999 leveraged buyout fund from the data sample. This fund, which benefited early in its life from the booming capital markets, drew above average amounts of capital in its first two years. The fund drew less than average amounts in the subsequent years, effectively decelerating its pace of investment to prevent investing more than 100% of commitments. Most likely a factor contributing to this "slow-down" was the dramatic correction in the private markets from 2001-2002.

These examples illustrate the idea that funds tend to invest around 90% of their capital by the end of the investment period and will adjust their behavior late in the investment period based on their capital draws early in the investment period. Exhibit 4 shows the conditional means of annual capital draws when the previous period's cumulative draws were above the average and below the average.

Exhibit 4: Conditional Means of Annual Capital Draws for Years 2 through 10

Fund Age (Years)	2	3	4	5	6	7	8	9	10
Number of Funds (n)	1611	1584	1502	1338	1184	1043	938	865	795
Unconditional Mean (All Funds)	0.22	0.18	0.12	0.07	0.04	0.02	0.01	0.00	0.00
Previous Cumulative Draws Above Average	0.19	0.12	0.04	0.02	0.01	0.01	0.00	0.00	0.00
Previous Cumulative Draws Below Average	0.22	0.20	0.15	0.11	0.07	0.04	0.03	0.01	0.01

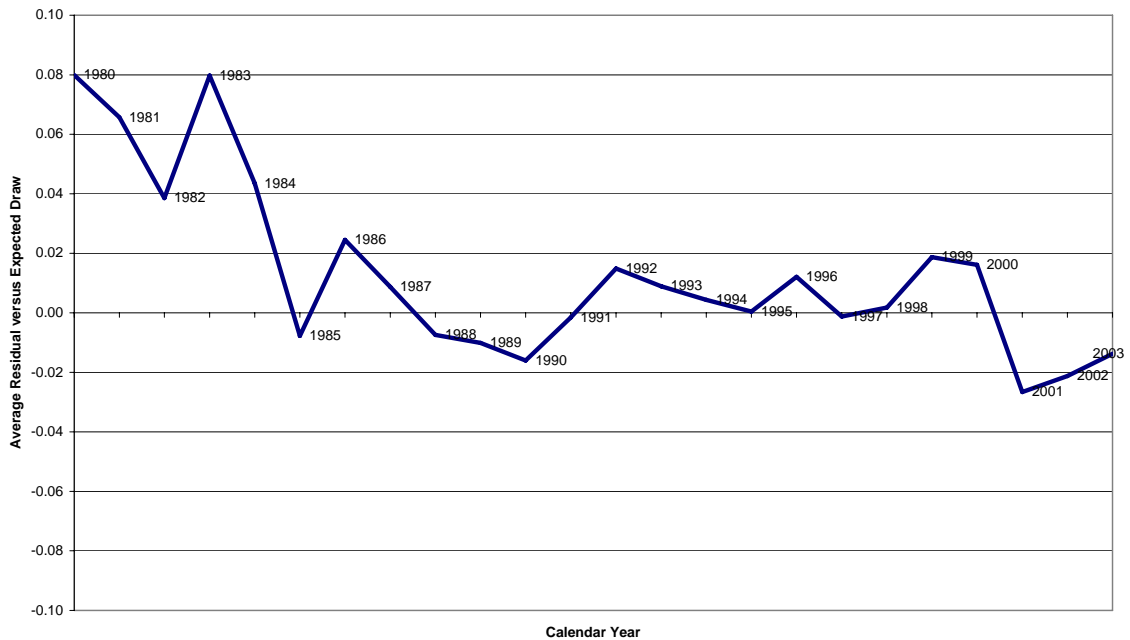
Source: Alignment Capital Group and Venture Economics

Note that when a fund had drawn more (less) than average in previous periods, it could be expected to draw less (more) than the unconditional mean in the following period. The conditional means, together with the mean reversion statistic cited in Exhibit 2 above, indicate that the patterns followed by the two funds chosen for Exhibit 3 are in fact tendencies followed by the full sample, which spans multiple economic cycles.

Finally, we determined that there was an industry-wide effect that contributes to determining how much capital a fund draws in a given calendar year. Exhibit 5 plots the average residual drawdown across all funds in a given calendar year. We calculated residual drawdown for each fund in each year by subtracting the expected draw (for a fund the same age) from each fund's actual drawdown in the calendar year. The

average of the fund residual drawdowns in each calendar year on the x-axis is plotted on the y-axis.

Exhibit 5: Average Residual Takedowns in Excess of Expected Value By Calendar Year



Source: *Alignment Capital Group and Venture Economics*

If there were no industry-wide factor affecting cash draws, the line in Exhibit 5 would vary randomly around zero. Instead it seems to be correlated with the environment in the private markets. The peaks of 1986, 1992, 1996, and 1999 correspond to strong capital market environments, while the valleys of 1990 and 2001 are clearly recessions and bear markets. It is worth noting that none of the points on the line after 1983 are statistically significant with greater than 60% confidence, suggesting that this industry effect was dominated by fund-specific factors.

CONCLUSION

In this research brief we study the historical characteristics of capital draws in private equity funds. Our results show that General Partners behave in accordance with their contractual limits on investable capital but also are influenced by their economic



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incentive to draw as much capital as possible. They do so by adjusting their behavior in the later years of the investment period to either decelerate or accelerate their pace of investment based on their amount of capital drawn early in the investment period. This has effectively increased above what we would find in the absence of such an adjustment process the observed likelihood a fund will be close to fully invested.

Additionally, there is empirical support for the existence of an industry-wide factor that influences the pace of capital draws in a given year; that draws accelerate in favorable market environments and slow in unfavorable ones. This factor, however, does not appear to be as strong as fund-specific factors such as fund age and how much capital the fund has drawn previously.



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Alignment Capital Group is a full-service private equity consulting firm based in Austin, Texas. The firm's mission is to understand private equity as an asset class in a portfolio context, and thus to assist our clients in making optimal investment decisions.

Andrew Conner is an Associate with Alignment Capital Group. His responsibilities include performing due diligence on investment managers, providing strategic portfolio management advice, and conducting original research.

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