

Mechanics of fund diversification

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Maximizing alpha while smoothing capital calls

Welcome

Professional investors are in the business of taking cash — the fundamental building block of all multi-asset portfolios — and investing it in a diversified portfolio of financial products. Investors with alternative or illiquid investments face cash management challenges, including estimating the amount of cash needed to fund capital calls and cover uncalled commitments. Managers draw down investors' capital (again, cash) over periods of five years or more, and there are significant penalties for missing a capital call.

This makes the effective and efficient management of cash critical for professional investors' success. Pacing models can help provide expectations for cash needs and probabilities to help investors make informed decisions about how much capital can be committed — without putting the organization at risk of missing a call.

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Here's what you 'need to know' from this brief.

- **Scenario planning:** Rather than viewing pacing models as a convenient way to forecast a single amount of cash to hold in reserve, investors should see them as presenting a range of potential cash-need outcomes. Said differently, investors' commitments to funds — and the associated liabilities — behave similarly to assets in terms of returns and volatility.
- **Fund diversification:** Increasing the number of funds held reduces the volatility of liabilities and enables smaller cash buffers. Particularly when an investor moves from one to two or two to three funds, investors can nearly

halve their capital call risk. Investing in three to six commitment-based funds¹ can strike an optimal balance between reducing cash drag while not over-diversifying away greater alpha potential.

- **Over-diversification:** Over-diversification to illiquid funds is common among institutions, as CIOs seek to construct portfolios that perfectly smooth capital calls. This portfolio approach to managing capital call risk is very expensive; it leads to lower fund performance (too many funds to drive the desired alpha), higher fees (smaller commitments preventing leverage in negotiations) and less contact with GPs (lower investment amounts, which reduces influence).

In short, getting the balance of funds right — achieving a ‘Goldilocks’ level of diversification by building sophisticated analytics around pacing — is a key to successful private market portfolios.

Significance

The simplest way to manage cash liabilities from private equity and venture capital fund commitments would be to set aside the total amount of the commitment from the time it’s made. Yet this would lead to substantial cash drag on the portfolio, given that holding cash is an expensive way to manage the liability. To address this problem, investors use pacing models to plan not only for cash reserves, but also to make ongoing allocations and size investments correctly.

A sophisticated pacing model has the potential to deliver meaningful outperformance. It isn’t by luck that the most commonly used pacing model for alternatives was invented by Yale’s endowment team. In order to effectively run the Yale Model, which represents a highly illiquid and alternatives-heavy portfolio, the team had to invent smarter ways of planning for cash needs (see Takahashi and Alexander, 2002). Moreover, as increasing numbers of investors follow Yale into alternative and illiquid assets, the importance of these models has skyrocketed.

This brief offers fresh insights into creating smart cash-flow diversification and pacing models. Most organizations we observed use Monte Carlo simulations, but we do not see

¹ The vintages of funds held will impact analysis. Analysis shown is based on holding vintage year constant. Contact us for sensitivity analysis on simulations across vintages.

this approach as sufficiently tailored to the specific needs of an individual investor. This brief shines light into this black box by connecting portfolio composition to confidence intervals.

Approach

To develop better pricing models, we pulled 93,486 capital call data points from Preqin² across 5,999 funds, spanning vintages from 1980–2021 with the most prevalent year being 2017. Geographically, roughly 75% of the funds in this dataset are based in North America. Over 80% of the total funds included in the analysis were private equity, venture capital and real estate.³

The capital call risk in various sized portfolios was calculated using simulations built upon the Preqin dataset. For private capital fund portfolios of between one and eight assets, we created 10,000 unique portfolios made up of randomly selected and equally weighted sets of funds. We used Preqin's capital call curve data to exhibit each of these portfolios' capital call curves, and when aggregated, were able to pull sample mean and standard deviations for each portfolio size (see Figures 3 and 4).

Key assumptions include:

- Cash flow values are net of fees.
- Cumulative contribution curves are non-decreasing.
- The start date of each fund is July 1st of the vintage year (unless there's evidence that it was earlier in the year).

Dispersion calculations between the 75th and 25th percentile (as shown in Figure 1), as well as median capital call curves across various private capital categories (Figure 2), were created using the aforementioned Preqin data. Meanwhile, the average number of alternatives held by high-net-worth (HNW) individuals was calculated by looking at Addepar's proprietary platform with its \$3.5 trillion in assets. Please also note that this analysis doesn't take into consideration cash distributions from private capital (this will be forthcoming in a future brief).

² Preqin provides data, analytics and insights in the alternatives space.

³ Data from the Preqin database was primarily sourced via the Freedom of Information Act.

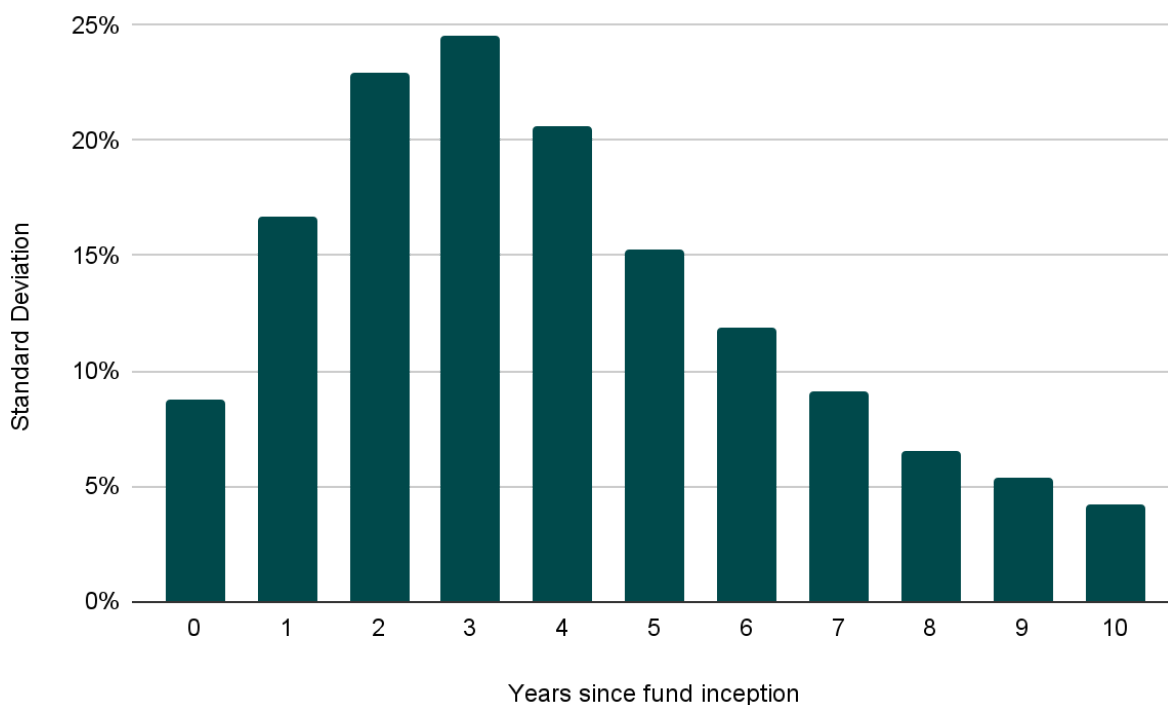
Findings

Looking at historical Preqin data, we found that the uncertainty in cash needs reaches its maximum level two to three years after fund launch. Uncertainty then decreases over time before mostly leveling off seven years after the fund's start date.

Figure 1

Standard deviation across the sample set

Standard deviation of cumulative cash contributions across entire sample set



Source: Preqin

Median capital call curve

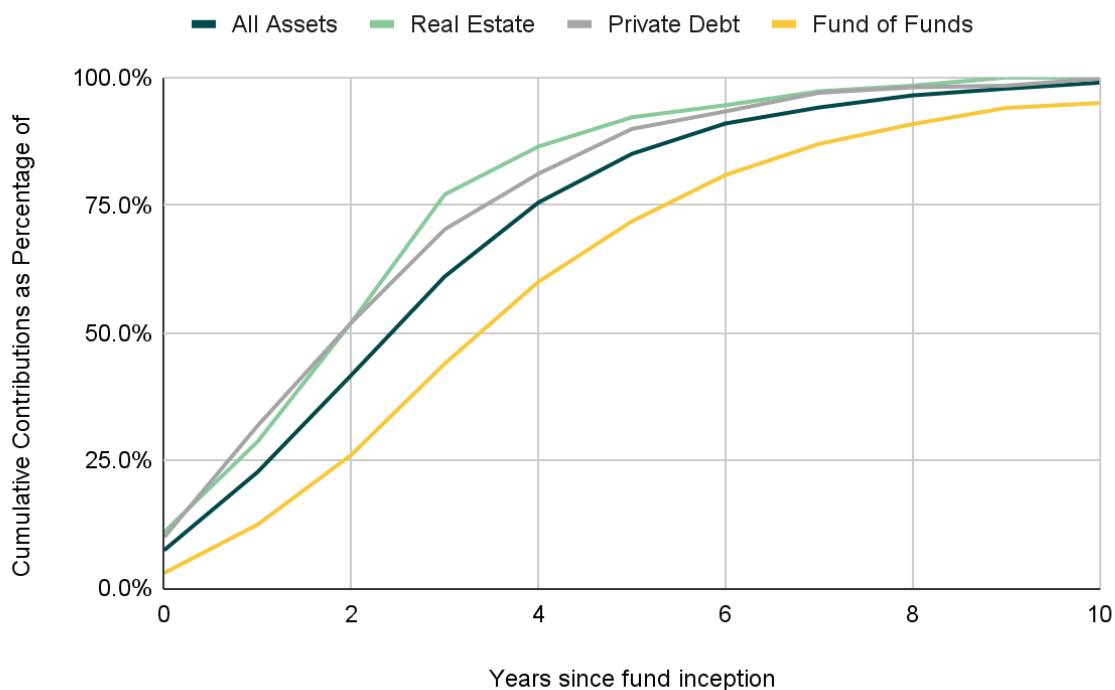
For the most part, the median capital call curve is consistent for both private equity and venture capital.⁴ This is because capital calls are driven by the investment opportunities of the fund's manager, and many of these investments in the major strategies have similar characteristics in aggregate. However, private debt and real estate funds tend to call capital more aggressively than the average fund, while fund-of-fund managers call for capital contributions at a slower rate than other fund types (see Figure 2).

⁴ This is not necessarily true across vintages, which will be the topic of a future ARB.

Figure 2

Range of expected cash contributions depending on strategy

Median cash contribution curves across all assets, the fastest and the slowest capital call curves



Source: Preqin

Average alternatives held by HNW individuals

As shown in Figures A.1 and A.2 (see Appendix), family offices and investment advisors that invest in private capital markets tend to only hold one or two funds. There can be many reasons for holding fewer private capital funds, particularly for smaller investors who face large investment minimums (relative to their wealth). But for those that can expand their holdings—given that a little diversification leads to a large measure of liquidity risk benefits (as detailed in the next section)—investing in a few additional funds can significantly improve investors’ cash management around private capital commitments.

Capital call risk benefits of larger private capital portfolios

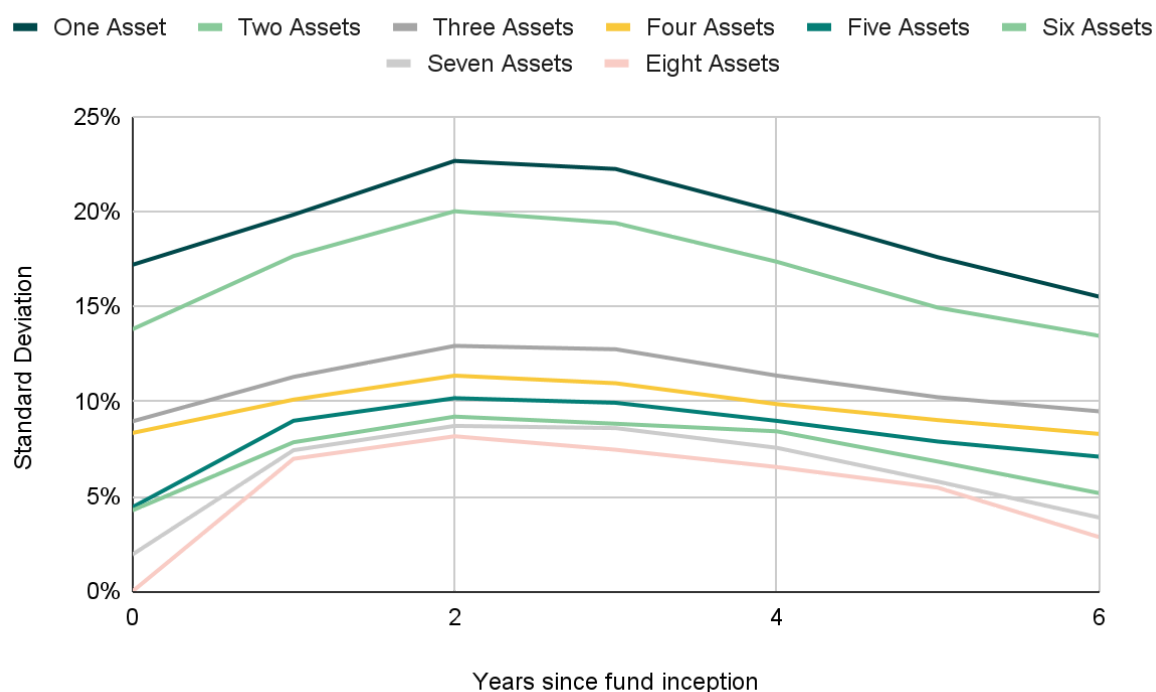
Investing in several private capital funds leads to a more consistent liability stream and allows for a smaller cash buffer compared to investing in a single private capital fund. To more clearly illustrate this, we created sets of equally weighted cash contribution streams that held anywhere from two to eight combined funds. We found that — without exception — as the number of funds in the portfolio increased, with the associated liabilities linked to

unfunded commitments, the standard deviation of cash contributions decreased from the vintage year through year six. Said differently, fund diversification across capital call curves can allow an investor to hold less cash, while maintaining the same cash risk as an investor who holds fewer funds.

Figure 3

Capital call risk decreases across all time periods as portfolio size increases.

Standard deviations of various sized portfolios from the time of initial capital commitment



Source: Preqin

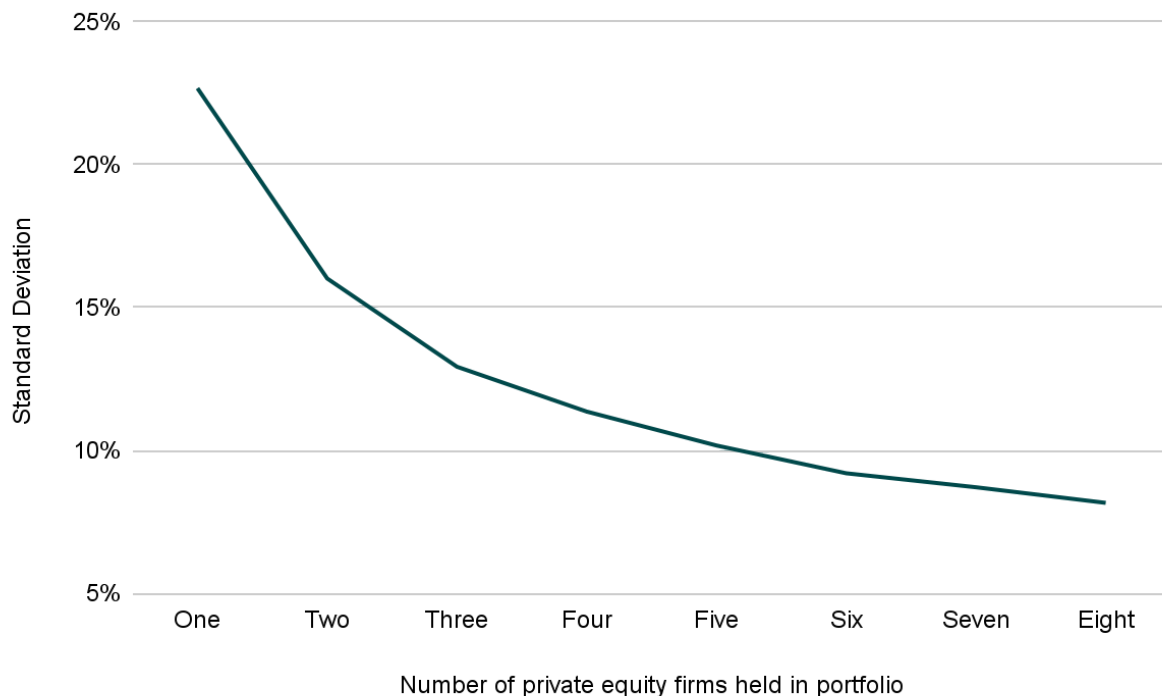
Importantly, note from Figure 3 that the vast majority of the benefits comes from fund diversification. As this suggests, the benefits of diversification from adding the sixth (or even a 10th fund from an institutional perspective) will likely not deliver sufficient risk mitigation to justify the cost and effort required to manage an increasingly diversified portfolio.

To see these issues more clearly, Figure 4 presents a closer view of the two-year point from Figure 3. As the size of the portfolio increases, the amount of capital call risk (as measured by volatility) decreases. These diversification benefits are largest when increasing the portfolio size from one to three assets.

Figure 4

Capital call risk decreases as portfolio size increases.

Standard deviation two years after initial commitment



Source: Preqin

Over-diversification starts at four to six funds.

While increasing the number of fund investments generates a more predictable call schedule (which subsequently allows investors to reduce cash drag), the increase in funds held also has the effect of diversifying idiosyncratic risk and reducing the potential for achieving excess alpha returns. To illustrate the point, we provide the dispersion in performance for n -sized portfolios of equally-weighted private capital funds⁵.

⁵ We calculated dispersion by dividing the 85th–15th interquartile range by 2. This is approximately equivalent to one standard deviation, which helps to better deal with this non-standard distribution.

Figure 5

Alpha potential decreases as portfolio size increases.

Dispersion of annualized cumulative performance across portfolio sizes five years after vintage date



Source: Preqin

The dispersion across simulated portfolios drops rapidly as the number of funds increases. Said differently, if you're creating a portfolio with three investments, the chances of you picking funds that earn you 5% or more annually above benchmark is 20%. If you pick 10 investments for your portfolio, the chances of you earning 5% above benchmark decreases to 10%.

The ARB-itrage

Undeployed cash can generate significant drag on a private equity portfolio. A minimal number of fund positions, say three or more, structurally diversifies future cash flows, which reduces cash flow volatility and ultimately means reduced cash buffers and less drag.

However, increasing the number of funds held can also have the potentially adverse effect of over-diversifying fund returns. For investors seeking to identify high-performing



managers and funds that provide excess alpha returns, diversification reduces the chances of being able to capture alpha, while increasing complexity and the operational burden of managing the portfolio. Portfolios of six or more fund positions run the risk of being over-diversified.

Here's the key insight from this ARB: Investing in three to six commitment-based funds⁶ for a given portfolio objective strikes the right balance between diversifying your future cash flows enough to reduce the cash drag on your returns, while not over-diversifying away your potential of achieving alpha. Put another way, choosing a small number of great investments is the key to a great portfolio. Investors really don't need that many investments to maximize alpha potential while smoothing capital calls.

Coda

Cash management planning for future capital calls should be analyzed in two steps. First, clearly understand the expected capital call in each time period. This can be affected by the fund's strategy, but all of the main strategies tend to have similar curves. Second, decide how much capital call risk you're willing to take on. You can mitigate this risk and hold smaller cash buffers by diversifying your private capital portfolio across vintages and over time. You can also gain considerable benefit through very little diversification. This is important because over-diversification can have detrimental effects on achieving your portfolio's key objectives.

⁶ The vintages of funds held will impact analysis. Analysis shown is based on holding vintage year constant. Contact us for sensitivity analysis on simulations across vintages.

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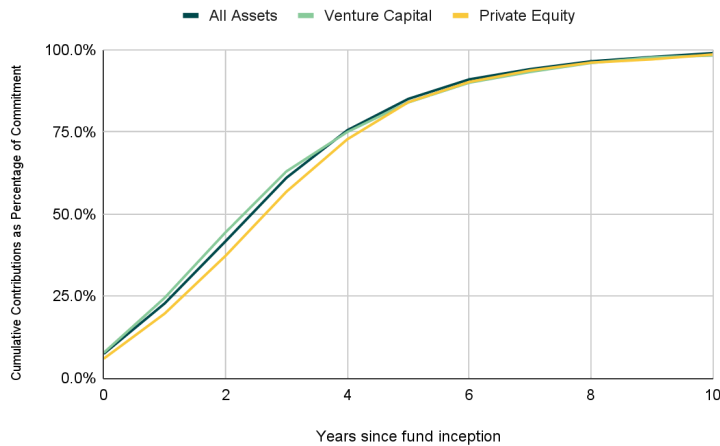
Appendix

Cumulative cash contribution curves for venture capital and private equity

Figure A.1

Cumulative cash contributions are roughly equivalent in the main strategies

Cumulative cash contributions in venture capital and private equity over time versus sample set median



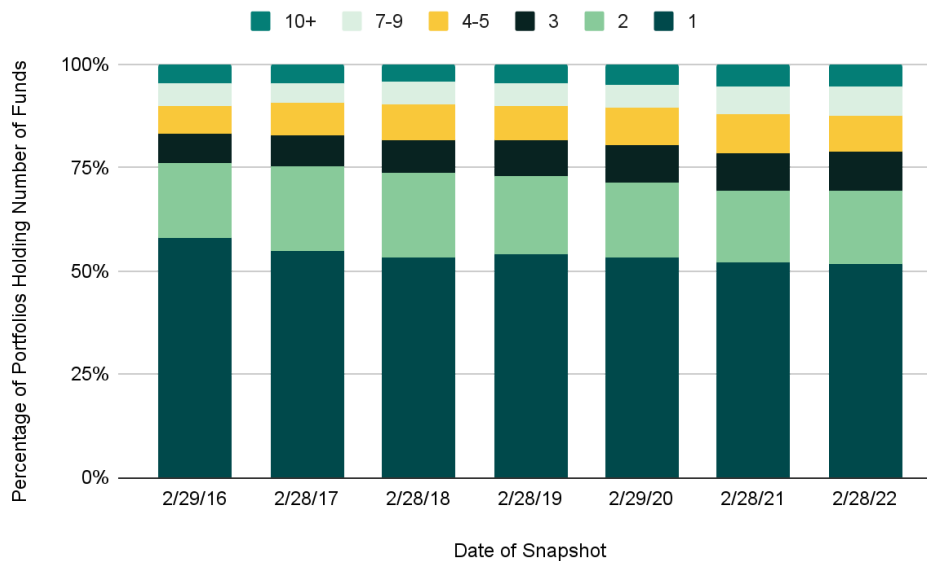
Source: Preqin

Number of alternatives held by investors over time

Figure A.2

Investors hold less than an ideal amount of funds in their private capital portfolios

Percentage of investors who invest in private capital funds with a given portfolio size



Source: Addepar



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