Insights+

Asset Allocation: Unsmoothing private capital returns

PREQIN

Key findings

1

At face value, private capital volatility is lower than public markets
Private capital indices such as Preqin's quarterly indices can provide a guide to asset level returns and volatility. However, LPs should be aware of the smoothing effect inherent in such indices, especially when trying to optimize portfolios in a mean-variance framework. For some LPs, volatility as a measure is ignored altogether in favor of other risk measures such as liquidity risk.

2

Betas calculations can provide insight to volatility
Betas and lagged Betas of private capital asset returns can provide a straightforward guide to implied systematic risk of private capital. A highlight of the report includes calculating cumulative Betas of 0.86 for private equity and 1.2 for venture capital against the returns of the S&P 500. These figures imply that volatility of private assets should be higher than exhibited by private capital indices.

3

Unsmoothing these returns can be simple or complex
Unsmoothing methodologies can be increasingly complex and tailored to each specific asset class. However, a standard autoregressive process provides informative results that align relatively well to the expected volatility estimates implied by the lagged beta model results.

4

Constraints needed to ensure public asset class inclusion in mean variance optimization
Due to the upward change in volatility, and the changes to correlations between assets, optimization using unsmoothed index returns leads to a more diversified portfolio compared with using the standard index returns. However, traditional mean-variance optimization still overweights private assets even with the unsmoothed indices, and purposeful constraints are required to ensure public asset classes are included in optimization results. Risk measures such as CVAR are also impacted by unsmoothing, with unsmoothed results suggesting a greater short-fall risk value when compared with raw index sample results.

Strategic asset allocation

The spotlight on private capital risk grows as allocation rises

Strategic asset allocation (SAA), including the design, construction, and review of portfolios, is the main top-down investment decision that supports institutional investors' goals for target returns, fund liabilities, and meet committed expenditures. Examining current day SAA trends, private capital allocation has grown significantly in the last decade, especially within institutional investor portfolios and more recently with growing capital from the wealth market. However, investors need to remain vigilant when considering private asset returns and volatility due to certain characteristics that set these investments apart from the same public market measures.

In focus in this report is private capital volatility, a measure of risk that some investors bypass altogether, choosing instead to focus on liquidity risk. This is due to concerns about what the 'real' volatility exhibited by private assets should be when taking into account smoothing effects (explored later) that appear to dampen volatility, as well as volatility's overall usefulness as a measure when investing in illiquid structures. Despite these concerns, many investors do continue to use volatility to support mean-variance optimization (MVO) or variations of the model (a baseline approach in the investment industry in the public markets) in aid of SAA decision making.

This report explores the implications of relying on private asset indices for SAA and risk management without further adjustments that make risk measures more comparable to public market indices. Relying on return indices at face value will cause MVO to skew weighting in a portfolio entirely to private assets We demonstrate how private asset indices can be 'unsmoothed", and the resulting impact the change has on optimal allocations in both unconstrained and constrained environments, alongside the impact on risk measures such as volatility and CVAR.

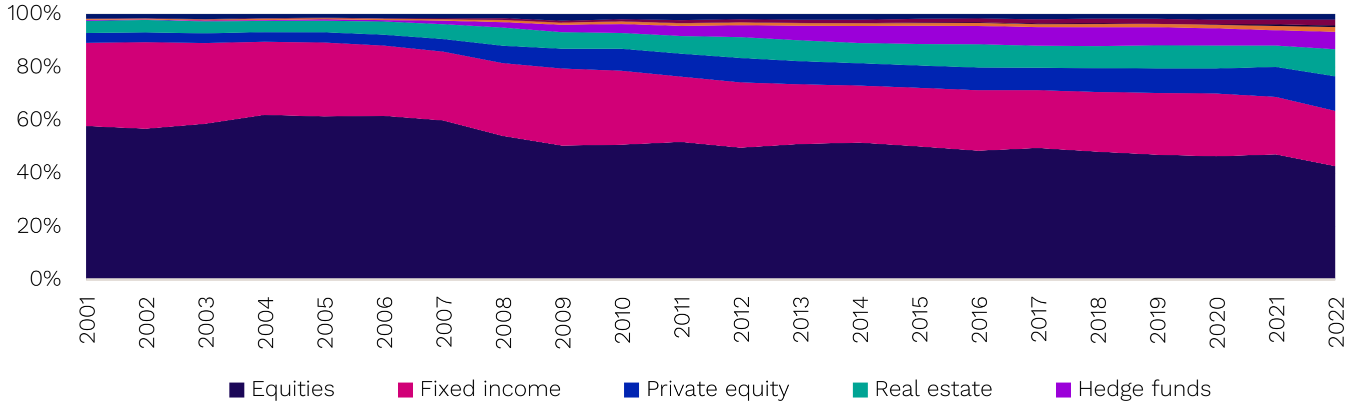
Private capital plays a big role in investors' portfolios

As earlier stated, SAA is deemed important to achieve the stated goals of a portfolio, but how much does it determine the under- or over- performance of portfolios? A seminal paper by Brinson et al. (1986) found that 90% of the total variation of return is generated by SAA.

However, more recent research from Xiong et al., 2010, suggests this number is overstated when considering the market return and total return separately. The authors found that 75% of variation in time-series returns comes from market exposure and movement, with the remaining returns roughly split between active management and asset allocation. Either way, SAA continues to be used by investors in deciding allocation to various asset classes, and of late this has meant increasing allocation to private capital.

Fig. 1: US institutional investors have loaded up on private assets

US local and state pension fund allocation to alternatives has increased from 2001 to 2022

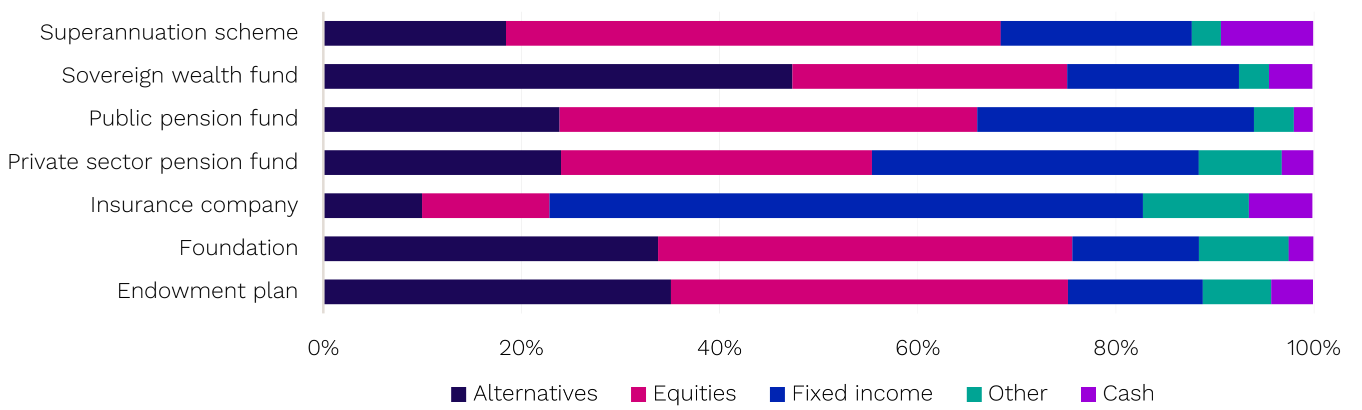


Source: Publicplans.org

On average, institutional investors have been increasing exposure to private capital allocation over time, a trend seen in the growing allocation to alternatives by US public local and state pension plans (Fig. 1). These funds have increased their allocation since the start of the millennium, and alternative investments made up 31.2% of total allocation, as of 2022 (this figure was 9% in 2001). Preqin data for 2023 shows how allocations differ across investor types (Fig. 2). Sovereign wealth funds, foundations, and endowments all have considerable exposure to alternatives, each with over 30% allocation. Meanwhile among institutional investor groups, insurance companies allocate the least to alternatives.

Fig. 2: Private capital has a role in all institutional investor segments

Asset allocation, 2023 by investor type



Source: Preqin Pro

As investors begin to explore private capital or even look to increase their target allocation, they need to carefully consider the unique nature of private asset returns and volatility, which, when taken at face value, may lead to naïve or suboptimal risk management portfolio outcomes.

Portfolio optimization with private capital

We consider private capital returns and volatility and the impact on four mean-variance optimization scenarios

Strategic asset allocation (SAA) utilizes portfolio optimization to guide decision-making around target allocations. Markowitz's (1952) mean-variance optimization (MVO) model has come to dominate the baseline optimization approach in the investment industry. At its foundation, MVO relies on historical or forecast asset level returns, volatility, and correlations/covariance between assets. The inclusion of private assets in portfolios introduces a layer of complexity that impacts the outcomes of MVO approaches. Some institutions ignore volatility altogether when deciding how much to allocate to private capital and consider other measures such as fund liquidity risk instead as part of more complex optimization problems.

For investors that wish to operate in public asset framework that relies on MVO, including private assets in this type of optimization carries overweighting risks, unless the allocation to these assets is specifically constrained or limited through the optimization process (some investors have adopted an illiquid constraint to the portfolio to reflect the need for certain levels of liquidity). This is because volatility exhibited by private assets indices are relatively low when compared with equivalent public market indices. Lower or dampened volatility will also mean private assets will be less correlated to public assets. Since MVO finds the ideal combination of investments that maximize portfolio return while minimizing risk, private assets are favored as these investments have both risk and return advantages as well as lower correlation, all of which helps to reduce portfolio level risk.

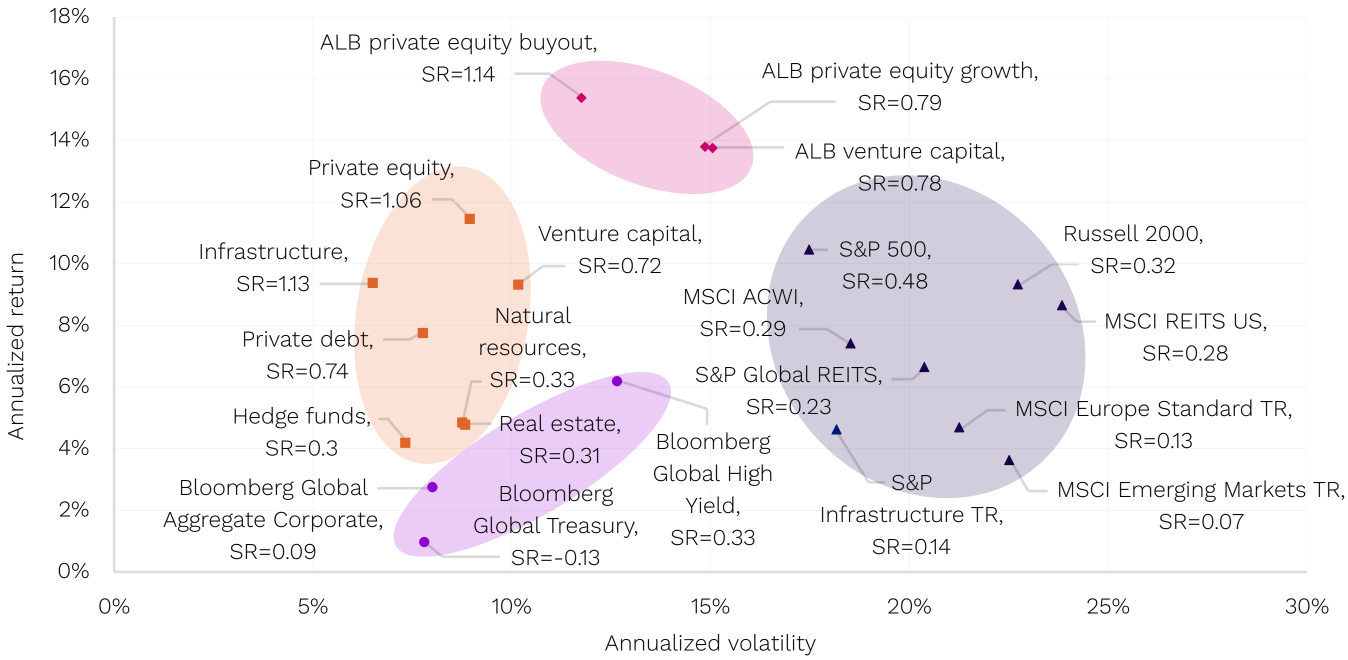
This only matters to investors if the risk indicated by private asset indices are artificially lower than what is 'truly' exhibited by these investments. A few industry professionals have gone so far as it to call out investors for 'volatility laundering' when significant private capital allocations are made for the stated purposed of artificially lowering volatility (Cliff Asness of AQR Capital Management writes extensively on this topic). Certain investment approaches are geared towards private capital growth assets, exemplified by the endowment model. This is typified by a high allocation to asset classes such as private equity or venture capital and hence face critique more loudly when underperforming the public market.

This report explores the private asset risk advantages, and the reasons why indices exhibited lower risk than anticipated according to academic studies (see Couts et al., 2023). It describes the potential fixes or 'de-smoothing' processes that investors can carry out before optimization, as well as the resulting change of portfolio weights and the implications for SAA.

Comparing listed equities with private assets: performance and risk
To illustrate the face-value advantage of private assets, returns and volatilities derived from Preqin's Quarterly Indices (net of fee returns) are compared with recognized public market benchmark results (Fig. 3). Preqin's indices are currently used by investors for optimization, SAA, and benchmark purposes.

Fig. 3: At face value - private capital outperforms on a risk-adjusted basis

Asset class returns and volatility, Q4 2007 to Q3 2023



Source: Preqin, MSCI, Factset

An asset class can be broadly grouped by its risk-return profile, with listed equites in one group (grey circle), private assets net of fees in another group (orange circle), gross of fees performance of private equity and venture investment (pink circle) in a third group, and public fixed income instruments in the final group (purple circle).

We found that, when comparing listed equity return benchmarks such as the S&P 500 with private equity and venture capital (VC) (net of fees), the latter asset classes exhibited significantly lower volatility. This discrepancy becomes even more pronounced when private equity and VC are juxtaposed with other listed equity benchmarks such as the Russell 2000, a more comparative benchmark of smaller listed U.S. companies, and the MSCI ACWI for global equities. Public equity benchmarks outside the US have also underperformed both private equity and VC in terms of lower returns and higher risk, as have listed equities exposed to real assets like REITS and infrastructure companies. The reduced risk observed in private assets has a consequential impact on the resulting Sharpe ratios (SR) for each asset, leading to outperformance against the Sharpe ratios of public equity indices (Sharpe ratios are calculated assuming a 2% risk free rate for ease of calculations). This trend holds true for private debt as well, where it not only outperforms high yield based on annualized performance but also exhibits lower volatility, resulting in a higher Sharpe ratio.

The highest performing asset in terms of Sharpe ratios using Preqin's net of fee's index data is infrastructure. Preqin's Infrastructure Index has posted returns that are double those of global corporate bond returns with similar risk, over the same period. Real estate and natural resources have both performed similarly to fixed income, but compared to US or global REITs, real estate posted lower returns but also lower volatility.

Preqin's asset level benchmarks (ALB) are gross of fees, so examining them may be more suitable for investors investing directly in private assets. ALB for private equity and venture capital yield superior returns compared with public market indices and net of fee indices for the same asset classes (as expected due to returns being recorded gross of fees). Interestingly though, volatilities exhibited by ALBs are higher than the equivalent net of fee indices. As will be explored later, accruing performance fee reduces returns because the expected deal value increases, and vice versa, dampening volatility. Despite this, even the elevated volatility levels remain noticeably lower compared with publicly market indices, especially asset level benchmarks for private equity buyout.

Baseline MVO: four portfolio scenarios

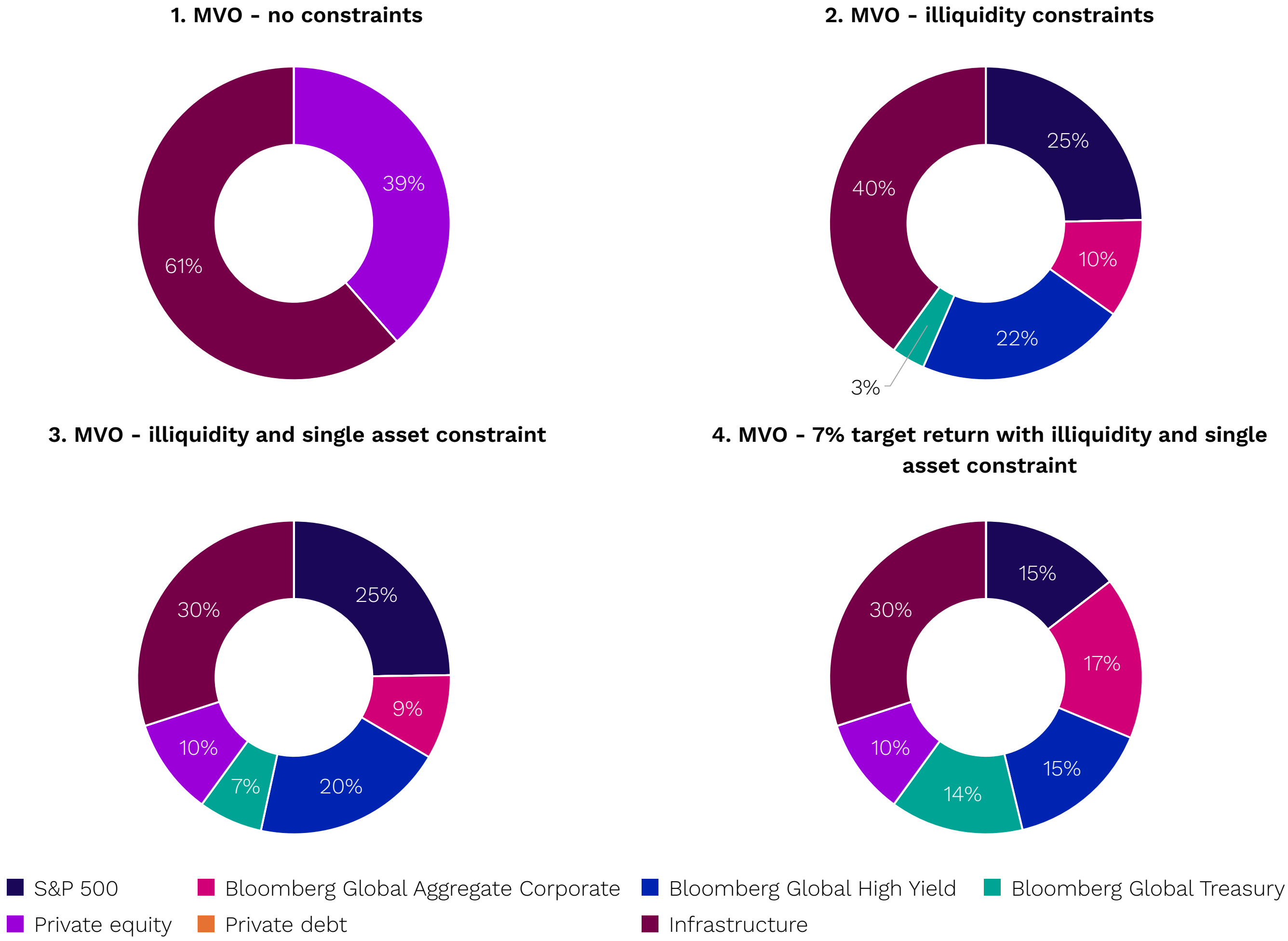
If you input the historical returns and volatility into a baseline MVO, it creates an efficient frontier based on these historical returns. But the optimized portfolio that is generated by the MVO will, if not constrained, allocate greater weight to assets with the highest Sharpe ratios and lowest correlations against other asset classes (Fig. 4). Preqin does not use the sample covariance matrix for optimization but a shrinkage of the covariance assuming constant correlation (see Ledoit and Wolf, 2003).

The initial portfolio appears unrealistic, as only two assets—private equity and infrastructure—have been allocated. Both are highly illiquid with lengthy lock-up periods. Introducing an illiquid threshold of 40% in the second scenario results in a more diversified distribution of asset weights toward public assets that reflects the need for liquidity and how institutional investors allocate against other objectives or approaches (e.g. allocating between liability matching vs. growth assets). The result in scenario two favors the risk and return profile of infrastructure, and it captures the entire allocation for illiquid assets. Investors can also extend this analysis as MVO has been shown to be very sensitive to small changes in model inputs. Full scale optimization efforts should consider the Resampled Efficiency technique proposed by Michaud (1998),

To further reflect common practices of institutional investors, a third scenario implements a maximum single private asset allocation of 30%, which illustrates investor practices dictated by internal investment policies or a regulatory requirement (e.g., pension funds in Switzerland which, according to the Ordinance on Retirement, Survivors' and Disability Pension Plans (BVV2) thresholds, limit real estate investments to 30%). This adjusts the optimization to include private equity in the private asset allocation, with minor changes in allocation between public assets. Lastly, a fourth scenario exists in which many investors consider a target return as an overarching objective of the portfolio (e.g. an 'actuarial' rate of return used as discount rate for pension plans), and the goal for SAA is to support and achieve that target. For example, 7.0% is the average long-term return assumption of US public pension funds in 2022, and so is used as a guide return target for the fourth scenario (based on data from The Public Plans Database). This changes the optimization problem to focus on a specific combination of assets that can deliver this target return with the lowest portfolio volatility. This results in lower allocation to the riskier asset, US large-cap equities (represented by S&P 500), and greater allocation in lower risk fixed income assets, while maintaining the same maximum allocation to private assets, as enforced by the illiquid threshold.

Fig. 4: MVO optimization will allocate heavily to private capital without restrictions

MVO output with and without an illiquidity and single private asset class limits



Source: Preqin

The greater number of assets in scenarios three and four are only achieved through the choice of constraints and thresholds that are imposed rather than as a natural result of the optimization process. However, many academic studies posit that private capital indices are actually smoothed due to inbuilt features and that volatility is actually higher than exhibited by index returns (e.g. Couts et al, 2023. If volatility is indeed higher, optimal weights in portfolios will also adjust even before any constraints are applied to the optimization process.

The unsmoothing problem

The simplest approach to unsmoothing private capital returns can yield informative results

Given that Preqin's and other private asset indices often rely on the data provided by GPs or LPs, it is likely that volatility is exhibiting a downward bias and the return series is smoothed as a result.

Three contributing factors are often cited in academic and industry research:

1. **Lagged impact and reporting:** Data on private market indices is usually collected on a quarterly basis and it takes time for market information to filter through to pricing. The longer it takes, the more short-term volatility is dampened, because many market-level knee jerk reactions are smoothed out over time.
2. **Appraisal-based valuations and stale pricing:** Private assets valuations are not only infrequent but often rely on internal valuation models. As a result, companies or real assets are very likely to be valued using anchors from prior values and exhibit stale pricing (Emery, 2003). Furthermore, the application of discounted cash flow models for fair value assessment in the valuation of private assets can contribute to the smoothing of Net Asset Values (NAVs). This smoothing effect arises from the model's design, which involves period-on-period adjustments to accommodate cash flow roll-overs.
3. **Impact of fees:** Fees in private capital, in particular performance fees, have the potential to impact volatility significantly, especially the asymmetric nature of the fees (GPs share in profits above hurdle rate but not any losses below). Ben-David et al (2023) show that a performance fee above a hurdle rate will translate to a significant share of the profits. The volatility dampening effect occurs because performance fees reduce returns when profits increases, while returns do not fall as much when profits fall because performance fees also decreases. This is evident in Fig. 1., which shows that gross-of-fee asset volatility for private equity and venture assets is notably higher than the net-of-fee counterpart indices.

From a statistical perspective, smoothing is evident in the presence of autocorrelation. Where correlation measures the movement between two different variables, the autocorrelation coefficient measures the movements between a variable and its lagged value. Using statistically significant autocorrelation coefficients, next-quarter returns for private assets can be explained by past-period returns (Fig. 5). By comparison, the S&P 500 TR Index has a low autocorrelation coefficient. Another method of detecting autocorrelation is the Durbin Watson test, with results at or close to two providing evidence of little or no autocorrelation. The rule of thumb is that between 1.5 and 2.5 is acceptable. Deviations below two indicate positive autocorrelation, while those above two suggest negative autocorrelation.

In general, private capital indices exhibit positive autocorrelation for the private asset classes, which provides evidence of the smoothing effect.

As a result of these effects and the impact of methodology on the valuation of illiquid assets, academics and practitioners have tried to negate the smoothing effects by suggesting ways to unsmooth private asset returns to capture their more representative volatility. But how can we ascertain the right levels of private asset volatility?

Fig. 5: Private capital indices exhibit positive autocorrelation across the board

Test for autocorrelation, Q4 2007 to Q3 2023

Asset class	Autocorrelation coefficient	Durbin Watson test statistic
Private equity	0.51	0.93
Venture capital	0.67	0.38
All hedge funds	0.15	1.25
Private debt	0.45	0.63
Real estate	0.59	0.61
Infrastructure	0.45	0.09
ALB PE buyout	0.40	1.17
ALB PE growth	0.28	1.47
ALB VC	0.38	0.92
S&P 500 TR	0.03	1.86

*ALB = Preqin Asset-Level Benchmark

Source: Preqin

What should private asset volatility look like?

Unsmoothing is a statistical procedure and Anson (2007, 2016) suggests a benchmark can be achieved by calculating Betas and lagged Betas of private asset returns when compared with their public market indices. The sum of Betas produce by a Beta model can be used to provide multiplication factor for volatility experienced in the public market space. One approach used by Anson is to consider the expected volatility by looking at the sum of lagged Betas in a basic capital asset pricing model (CAPM). The model is presented below, with Rf representing the risk-free rate (Treasury bills).

$$(Asset\ Return - R_f) = a + \beta_1(Market\ Return - R_f) + \beta_2((Market\ Return_{t-1} - R_f) + \beta_3((Market\ Return_{t-2} - R_f) + \beta_4((Market\ Return_{t-3} - R_f) + \beta_5((Market\ Return_{t-4} - R_f) + ((Asset\ Return_{t-5} - R_f)$$

For the purposes of this report, five lags across asset classes were calculated and statistically significant Beta results were summed to determine the summed Beta that acts as a multiplicative factor against the public index volatility. This process estimates the implied systemic risk of the asset class in question (Fig. 6). This approach does not consider unsystematic risk.

Fig. 6: Lagged Betas of private assets provide a rough guide to volatility

Private capital market summed Betas and implied exposure to systematic risk, Q4 2007 to Q2 2023

	Est. Betas	Implied systematic volatility using lagged beta model	Implied volatility	Model R2	Public market benchmark
Private equity	0.86	8.90%	15.0%	0.73	S&P 500
Venture capital	1.23	10.10%	21.5%	0.55	S&P 500
Private debt	0.36	7.30%	8.0%	0.65	Bloomberg Global High Yield TR
Real estate	0.89	8.80%	15.6%	0.72	S&P 500
Infrastructure	0.36	6.50%	6.3%	0.37	S&P 500
ALB buyout	0.88	11.80%	15.3%	0.59	S&P 500
ALB growth	1.31	14.90%	22.9%	0.44	S&P 500
ALB venture capital	1.16	15.10%	20.3%	0.38	S&P 500

*ALB = Preqin Asset-Level Benchmark

Source: Preqin

The results of the lagged beta model are mixed. As expected, the model suggests that both private equity and VC should exhibit higher volatility than what is exhibited by the Preqin private capital indices. Moreover, when performing the process on the Preqin ALB gross-of-fee indices for buyout, growth and VC, the implied volatility is in similar ranges to the net-of-fee basis index results.

Other asset classes produced mixed results. For real assets, the real estate implied volatility is well above the private index volatility, while infrastructure's implied volatility is a little lower than the private index using the same model. For private debt, the implied volatility is slightly higher compared to the private capital index volatility when using a high-yield benchmark (application of this model may be inappropriate for credit instruments but is presented for comparative purposes). If we focus on the R-squared value to determine the fit of the model, we see that the lagged Beta model has more explanatory power for private equity, real estate, VC, and private debt.

It is important to note that this analysis ignores the impact of leverage. Some studies have suggested that the heavy use of leverage should mean that volatility of private capital indices for private equity and venture capital in particular be higher than public market volatility. One study suggested private equity should have a beta of at least 1.2 or higher (L'Her et al, 2017). However, others detect similar volatility for private equity and public markets (Czasonis et al, 2021), finding no evidence of the relationship between leverage and volatility. Despite the mixed views, volatilities from the lagged model are compared with the unsmoothing results in the following section.

Unsmoothing: comparing approaches

Academics and practitioners have tried to reconcile the issue of dampened or smoothed volatility by attempting to unsmooth private assets returns. This has been well documented, in particular with real estate indices (Geltner, 1993). This means that investors now have several popular options for unsmoothing indices. Marcato and Key (2007) explain some of the prevailing models and suggest that the choice of model is not the biggest determinate on the impact of unsmoothed volatility, and thus portfolio optimization. Instead it is a smoothing parameter that appears across methodologies that most impacts portfolio optimization the most. This report focuses on autoregressive filter approaches because they are simplest to implement and can demonstrate how unsmoothing returns can impact mean-variance optimization (MVO) outcomes.

The autoregressive (AR) filter model as proposed by Geltner (1993) generates unsmoothed returns using an AR process based on one lagged time period. It is also dependent on actual returns data, alongside interaction with a smoothing parameter α_1, and the last quarter return. The model is outlined as follows:

Model 1 – AR (1) Filter: $Unsmoothed\ Return = (Return_T - \alpha_1 \times Return_{T-1})/(1 - \alpha_1)$

We can extend this model by considering greater orders of lag. Two lags are considered in Model 2 as Marcato and Key (2007) find no evidence that any more are necessary. Our statistical tests show no evidence of autocorrelation beyond two lags and so support their assessment. The extended model is presented below:

Model 2 – AR (2) Filter: $Unsmoothed\ Return = (Return_T - \alpha_1 \times Return_{T-1} - \alpha_2 \times Return_{T-2})/(1 - \alpha_1 - \alpha_2)$

Other methodologies have been developed for return series unsmoothing, such as those presented by Getmansky et al. (2004), and Couts et al. (2020), that extend on the AR by considering more complex assessments, such as regime change. By this we mean a structural change in the identified trend, perhaps caused by a significant shock to market, e.g. a financial crisis. Regime change appears to be a factor in de-smoothing, but the scope of this report does not extend to exploring regime change across all asset classes during the period considered (2007 to 2023).

A key consideration for LPs in using an unsmoothing transformation is determining the smoothing parameters, α_1. For this study, Preqin will use the lagged coefficients from the following regression to estimate $\alpha_1$in Model 1, and α_1 and α_2 in Model 2.

$Return_t = a + \alpha_1 Return_{t-1}$

$Return_t = a + \alpha_1 Return_{t-1} + \alpha_2 Return_{t-2}$

The parameter estimation approach is expected to have the biggest impact on unsmoothing results and the recorded volatility. Other options could be to use Beta values from the lagged Beta model for each lagged period, but again, the autoregressive approach is straightforward to implement and can demonstrate the impact unsmoothing has on MVO (Fig. 7). Volatility for the unsmoothed returns is higher than sample index volatility for all asset classes. The results are also similar between the AR(1) and AR(2) Models, except for larger differences in real estate, where it is higher in the AR(2) Model and smaller for private debt and infrastructure. Autocorrelation coefficients are also near zero for all unsmoothed asset returns.

Fig. 6: Lagged Betas of private assets provide a rough guide to volatility

Private capital market summed Betas and implied exposure to systematic risk, Q4 2007 to Q2 2023

	Volatility			Autocorrelation coefficients		
Preqin Quarterly Index	**Sample**	**Unsmooth AR (1)**	**Unsmooth AR (2)**	**Sample**	**AR(1) Model**	**AR(2) Model**
Private equity	8.94%	15.70%	16.00%	0.51	-0.02	-0.02
Venture capital	10.16%	22.00%	25.43%	0.67	-0.07	0.04
Private debt	7.76%	12.60%	9.90%	0.45	0.11	-0.01
Real estate	8.82%	17.10%	24.67%	0.59	-0.22	0.04
Infrastructure	6.50%	10.30%	7.93%	0.45	-0.10	-0.09
Natural resources	8.75%	12.60%	10.74%	0.34	0.06	0.05
Preqin ALB						
ALB private equity buyout	11.75%	18.20%	19.22%	0.40	-0.04	-0.02
ALB private equity growth	14.87%	20.10%	19.14%	0.28	0.01	0.01
ALB venture capital	15.05%	22.70%	30.86%	0.38	-0.11	0.06

*ALB = Preqin Asset-Level Benchmark

Source: Preqin

Digging deeper into volatility figures from the AR(1) model, unsmoothed private equity volatility is 15.7% and for VC, it is 22.0%. This can be compared with the lagged Beta model implied volatility of 13.2% and 19.4% (Fig. 6). The results are relatively close for these assets. Conversely, for other assets, results are higher than in the lagged Beta model, with private debt unsmooth volatility at 12.6%, real estate significantly more at 17.1%, and infrastructure at 10.3%. Arguments can be made that the results from the AR(2) model are reflective of expectations for private debt and infrastructure, but the real estate volatility is considerably higher at 24.7%. Investors may choose different approaches for different asset classes but, we will only apply AR(1) return series to all private capital indices to simplify the interpretation of MVO results.

Portfolio optimization with unsmoothed returns

Unsmoothing can help with downside risk management

Following our research, we found that incorporating the unsmoothed return series into the optimization model brings about the changes we anticipated in the four scenarios (Fig. 8). Greater volatility meant inclusion of a greater number of asset classes in different scenarios, but overall the baseline MVO still favors private capital asset classes in an unconstrained scenario.

Scenario 1
In the initial unconstrained portfolio scenario, the outcome still favors private assets, and infrastructure in particular, alongside allocation to both private equity and private debt. Despite the increased volatility, MVO still favors the risk/reward ratio of these assets alongside the lower correlation against other asset classes.

Scenario 2
In the second scenario, infrastructure claims the entire illiquid allocation, while US large-cap equities and global high-yield assets constitute the public asset portion.

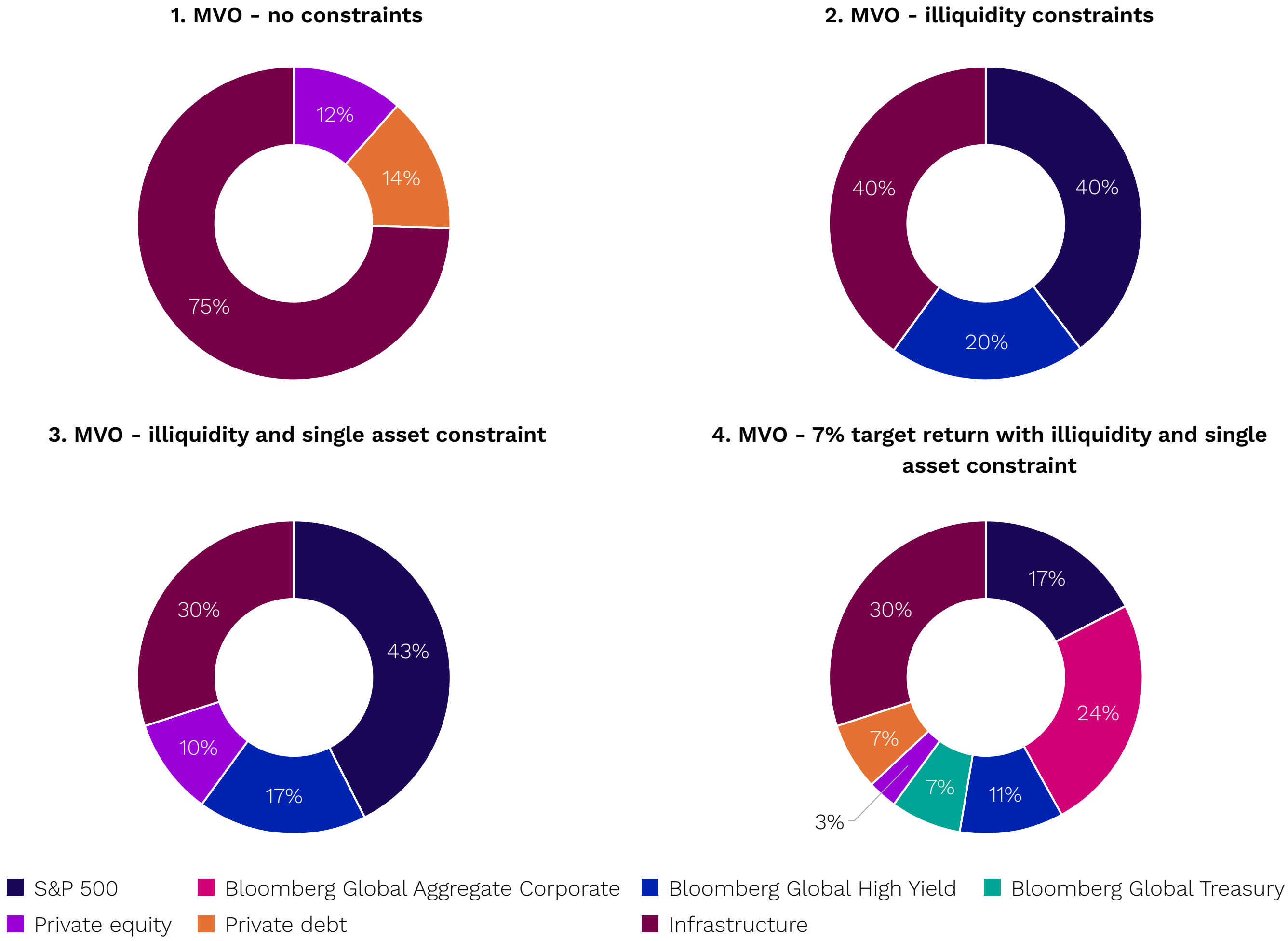
Scenario 3
In the third scenario, the sole adjustment is the introduction of a 10% allocation to private equity, enforced by a single private asset restriction of 30%.

Scenario 4
Lastly, in the 7% target portfolio scenario, the result is a more diversified portfolio compared with the raw sample. It comprises a mix between infrastructure, private equity, and private debt on the illiquid side. On the public and sovereign side, there is allocation to US large-cap equities, global corporate bonds, high-yield assets, and treasuries. These modifications highlight the impact of including unsmoothed return series.

Comparing the constrained portfolio frontiers of scenario three is another way to visualize the range of returns associated with asset volatilities and the impact of unsmoothing on portfolio volatilities (Fig. 9). The unsmoothed portfolio frontier is noticeably to the right of the sample frontier, reflecting the impact of higher volatility for private capital assets. For a given level of return, the volatility is higher across the frontier in the unsmoothed example. The maximum Sharpe ratio is also impacted, represented by the scatter dots on the two frontiers. Investors should consider the arguments for and against the use of volatility in optimization for SAA, the range of unsmoothing methodologies and outcomes, and could also consider a greater number of statistical moments in optimization process including kurtosis and skewness for asset allocation purposes (This topic will be discussed in Preqin research published later in the year).

Fig. 8: Unsmoothing shifts asset weights but optimization still favors private capital

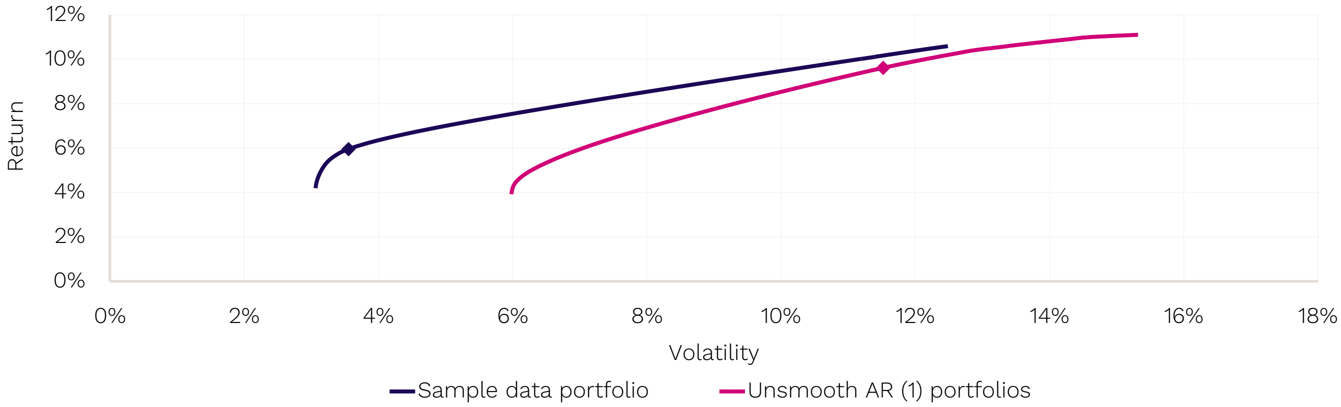
The impact of unsmoothing returns on different portfolio scenarios



Source: Preqin

Fig. 9: Frontier comparison between smooth and unsmoothed portfolios

Portfolio frontier, Q1 2007 and Q3 2023



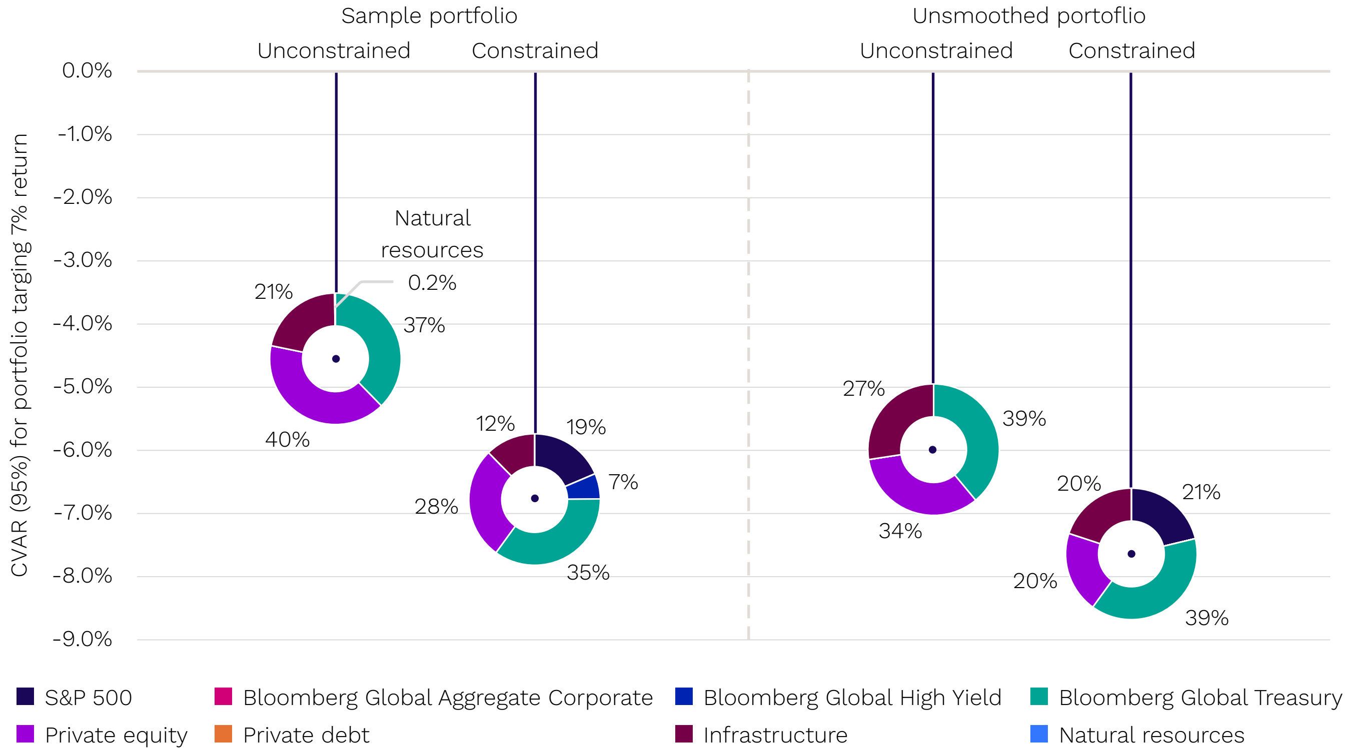
Source: Preqin

The importance of unsmoothing for risk management

Finally, unsmoothing will also impact the other risk measures LPs consider as part of their risk management process. One such measure is conditional value-at-risk (CVAR). This is also known as expected shortfall and is an assessment of tail risk. Every portfolio has a target return, but also an expected shortfall. Unsmoothing returns demonstrates how this shortfall will be higher than just face value index returns and also impact the resulting optimized portfolio weighting (a confident interval is set at 95% and is associated with a shortfall in the worst 5% of outcomes). Instead of minimizing volatility, the optimization process minimizes CVAR for a given level of return.

Fig. 10: LPs may be underestimating shortfall risk if unsmoothed returns are not utilized

Expected shortfall in different scenarios across sample and unsmoothed portfolios



Source: Preqin

In the unconstrained scenario, the expected shortfall is 4.6% of the sample portfolio versus 6% for the unsmoothed portfolio when targeting a portfolio return of 7% (Fig. 10). Without any constraints, the optimization process now includes an asset outside of private asset classes (global treasury). When adding the illiquidity and single private asset class constraints alongside a return target of 7%, the expected average loss increases in the unsmoothed portfolio to 7.6% in the worst 5% of situations. The optimal portfolio here allocates weights to private equity, infrastructure, global treasuries, and US large-cap equities. Similar to the volatility takeaway, LPs may underestimate shortfall risk if smoothing effects are truly present in indices that fail to capture drawdown risks, especially in financial crises.

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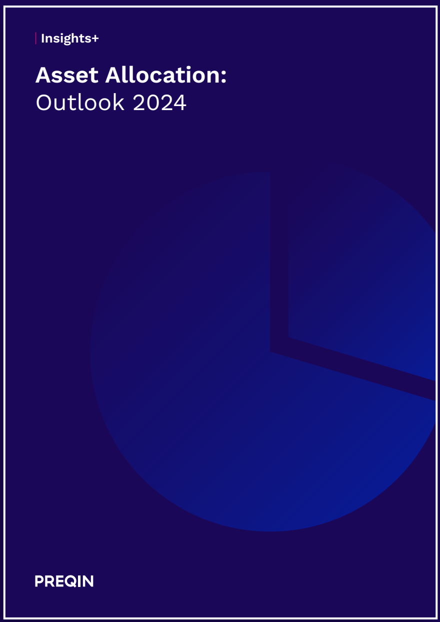

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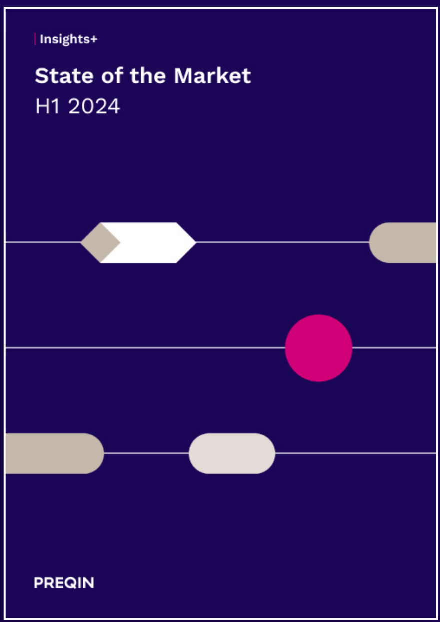

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