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Strategic Integration of Private Assets into Multi-Asset Allocations

A practical guide for institutions

Amundi
Investment Solutions

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Strategic Integration of Private Assets into Multi-Asset Allocations

Abstract

This study presents a practical framework for sizing private asset allocations and planning capital commitments from the perspective of a Multi-Asset allocator. In today's evolving investment landscape, private assets have become a crucial element of institutional portfolios, offering distinct advantages such as enhanced diversification, the potential for higher risk-adjusted returns, and lower correlation with traditional public markets. However, integrating illiquid investments into multi-asset portfolios introduces a set of unique challenges that CIOs must navigate carefully.

Effective private asset integration requires a deep understanding of their inherent characteristics, such as extended investment horizons, complex cash flow dynamics, and valuation nuances, and how these characteristics impact portfolio construction and risk management. Central to this process is the need for disciplined strategic asset allocation that aligns private assets with broader portfolio objectives, liquidity constraints, and risk tolerance. Importantly, the traditional separation between strategic planning and implementation should be bridged, as commitment pacing and capital deployment decisions and constraints not only directly influence portfolio outcomes and liquidity profiles, but could alter the risk profile and should be consider in the strategic planning.

This study highlights the importance of advanced modelling techniques in addressing valuation biases and accurately capturing the risk-return profile of private assets. It also emphasises the critical role of commitment-pacing strategies, particularly those based on targeting a fixed percentage of private asset net asset value (NAV), which enables investors to build and maintain exposure efficiently while managing liquidity and vintage diversification. Such approaches outperform simpler methods based on unallocated capital, especially for investors who are both new and experienced with private assets.

Moreover, this study discusses the delicate balance required to manage overcommitment and undrawn capital, which are key factors influencing liquidity risk and portfolio stability. By adopting tailored commitment plans, diversifying across vintages and managers, and aligning liquid asset strategies with private market cash flow needs, investors can better mitigate risks and enhance the likelihood of achieving their strategic exposure goals.

In summary, this comprehensive framework equips with the tools and insights needed to successfully integrate private assets into multi-asset portfolios, enabling investors to navigate the complexities of private markets and deliver long-term financial objectives in an increasingly challenging environment.

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Key words: private assets, strategic asset allocation, illiquidity premium, commitment pacing, J-curve, liquidity, uncalled capital

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1 | Private assets role in a multi-asset allocation

In recent years, private assets have played an increasingly significant role in financial markets, as many institutional clients have tapped into these asset classes for asset allocation. This trend has gained traction in a market landscape where investors seek additional resources for their investment programs, as portfolio diversification has become more challenging, opportunities have become less rewarding, and alpha has become scarcer.

Despite the recognised complexities of this asset class, several factors have contributed to its growing popularity in asset allocation. Empirical evidence demonstrates the benefits that private investing can bring to a portfolio, while the greater availability of educational content and improved technological tools for analysing risk exposure have made private assets more accessible. Additionally, the increasing availability of investment opportunities has further fuelled interest in this asset class.

The rising popularity of private assets in institutional and, more recently, retail portfolios demands an in-depth analysis of the modelling challenges associated with these investments, which are explained in the following sections.

1.1. Why investors should allocate to private assets

Over recent years, private assets have emerged as a pivotal component in institutional portfolio construction, driven by the challenges in public markets affected by concentrated equity indices, elevated valuations, and an overall scarcity of alpha-generating opportunities. Institutional investors increasingly adopt private assets to enhance diversification, improve portfolio returns, and access parts of the economy inaccessible via public markets. This shift is underscored by the declining number of publicly listed companies and the growing economic significance of private enterprises, emphasizing the necessity of private market exposure in modern portfolio theory frameworks.

1.2. Private assets contribution to a multi-asset allocation

From a strategic asset allocation perspective, private assets provide distinctive advantages grounded in their intrinsic illiquidity premium, diversification potential, and low correlation with public market betas.

Private equity strategies ranging from venture capital to buyouts exhibit varying risk-return profiles, enabling investors to tailor allocations consistent with their risk appetites and return objectives. On the debt side, private credit has flourished as banks retract from lending to middle-market firms, creating a disintermediated lending environment where non-bank private investors benefit from floating-rate loans with strong covenants, delivering income diversification and acting as natural inflation hedges due to their floating-rate structures.

Infrastructure and private real estate further contribute to portfolio robustness by providing inflation-linked real assets with stable cash flows and unique risk-return characteristics. Infrastructure investments often entail assets with contractually inflation-linked revenues, high entry barriers, and long operational lifespans, positioning them as strategic inflation mitigants. Private real estate strategies encompass a broad spectrum—from conservative core to opportunistic

investments—each with distinct cash flow and appreciation profiles, supplementing public real estate investment trusts (REITs) by avoiding market volatility inherent to publicly traded securities.

Multifaceted dimension to private assets indexing

Despite compelling benefits, the incorporation of private assets entails significant modelling and data challenges that depart substantially from traditional liquid asset classes. Private asset returns are predominantly reported via internal rate of return (IRR) metrics, complicating performance evaluation due to IRR's inherent biases and reinvestment assumptions. Furthermore, appraisal-based valuations and infrequent pricing generate smoothed return series that underestimate volatility and correlation, requiring adjustments such as unsmoothing techniques to better reflect underlying economic risk. Data biases including selection, survivorship, and backfill distortions further complicate benchmarking. Specialized private market indices attempt to mitigate some of these issues, but no universally accepted standards exist, necessitating bespoke modelling aligned with specific investment objectives.

BOX 1: Diving into private assets data challenges

Measuring performance and risk: IRR vs traditional metrics and benchmarks

Private asset performance is typically reported using the internal rate of return (IRR) rather than the time-weighted return (TWRR) used for public markets. The IRR is the discount rate that sets the net present value of cash flows to zero. While widely adopted, it introduces several issues:

- Multiple or unstable solutions: when cash flow signs change more than once, IRR may fail to converge or yield multiple values.
- Reinvestment assumption: all interim cash flows are assumed to be reinvested at the IRR, which is unrealistic in practice.
- Averaging distortions: the average IRR across funds differs from the IRR of aggregated cash flows, especially when fund durations vary. Early profitable exits can inflate reported IRRs.
- Duration bias: because shorter funds often report higher IRRs, averaging across different fund lifespans creates an upward bias.

By contrast, public assets rely on well-recognized benchmarks with transparent and frequent pricing. The absence of such standards in private markets complicates performance assessment and comparison. Private asset valuations are not always based on observable market prices. They may rely on expert appraisals or self-reporting by managers, which introduces risks of:

- Selection bias: underperforming funds may stop reporting.
- Return smoothing: managers may manage valuations to reduce apparent volatility.
- Survivorship bias: only active funds remain in the dataset.
- Backfill bias: historical performance is sometimes added when funds first report, artificially raising historical averages.

Partial corrections exist, such as public market equivalents (PME) or econometric adjustments, but they cannot fully eliminate distortions.

Specialized benchmarks are offered by Cambridge Associates, MSCI Burgiss, SIPA Metrics (EDHEC), Pitchbook, and Preqin, each with different coverage, sources (GP data, LP data, balance sheets), and pricing methodologies (primarily appraisal-based). These benchmarks are used for:

- peer comparison: assessing fund performance relative to industry peers.
- strategic modelling: generating capital market assumptions to inform portfolio construction.

A persistent feature of private equity performance is the J-curve effect: early costs depress returns, while value creation materializes only later. Benchmarks providers aggregate multiple funds' cash flows to produce usable asset class time series.

Data and lag issue when dealing with liquid-illiquid allocation

Private asset data are typically appraisal-based, updated only at transaction points, leading to:

- Infrequent pricing: the price discovery occurs rarely and only when assets are transacted.
- Smoothing of valuations: valuations are updated with limited frequency and generally with mild periodical changes. This causes returns volatility and correlations to be understated.

A common adjustment is to unsmooth returns by removing serial correlation, producing time series that better reflect underlying risks.

Private asset returns differ significantly from public markets ones:

- Returns distributions are generally Non-Gaussian: they exhibit fat tails and asymmetry.
- Illiquidity premium: investors require compensation for long holding periods and costly rebalancing.
- Tail risk: maximum drawdowns during liquidity events are more relevant than volatility alone especially for return distribution which are not normal.
- Idiosyncratic risk: unlike public markets, private investments lack a stable market beta, making expected risk premia difficult to estimate.

These characteristics must be incorporated into allocation models to avoid misrepresenting risk/return trade-offs and excessive exposure to these assets for non-experienced investors.

Reference to previous paper for additional detail[1].

[1] https://research-center.amundi.com/article/allocating-real-and-alternative-assets-framework-institutional-investors

Asset class modelling and investment planning

When defining a risk profile and reference allocation that aligns with specific investor requirements, one of the most important approaches is to assess capital market assumptions (the combination of expected returns, volatility, and correlations) for the reference investment universe. In the context of mixing liquid and illiquid assets, it is essential to analyse them through a lens that minimises biases and makes them comparable to one another. We believe that it is important to use well-known private asset datasets, as they provide valuable insights into the differences between liquid and private assets. However, data quality issues must be addressed as necessary. When defining private asset proxies for illiquid assets, we prefer market-based data over appraisal-based data, even though the former are less frequently available. We carefully reviewed data collection procedures from various providers, favouring those that employed more structured and well-documented approaches (such as audited or General Partner (GP) data). Additionally, we compared different databases to verify the information and estimate the granularity.

We typically unsmooth private asset time series of returns by removing serial correlations, which can indicate various biases. These unsmoothed time series are then used to model private asset returns and derive forward-looking simulations, which are mainly used to set strategic target exposures. Scarce liquidity is one of the most significant factors supporting private assets, making it crucial to assess the illiquidity premium attached to them by examining historical data, removing biases where possible, and evaluating forward-looking triggers. Equally important is identifying the liquidity risk associated with the premium, as it can lead to losses during divestment or significant liquidity events. The focus on risk components, particularly shortfall risk, plays a critical role in assessing the risk profiles of illiquid assets. This risk is not always fully captured by volatility metrics alone, but it requires a focus on shortfall and liquidity risks.

Our capital market assumptions model is designed to shape the forward-looking asset return distribution. The calibration process specifically accounts for the unique characteristics of illiquid assets, such as asymmetry and tail risk, as well as the risks they may face, including liquidity events. These factors are incorporated into our forward-looking analysis using a simulation engine integrated with the Cascade Asset Simulation Model (CASM).

Our model is designed with a cascade structure. Asset and liability price models are constructed from market risk factor models that encompass asset prices and other financial variables. These market risk factor models are based on macroeconomic data. This hierarchical structure enables the platform to effectively capture both linear and nonlinear relationships among risk factors, asset prices and financial instruments.

We employ a macro-based normative approach to integrate the modelling of private and alternative assets into the CASM framework. Each model is defined by its relationship to key building blocks that have been identified as statistically and theoretically significant: macroeconomic variables (such as growth and inflation), financial variables (including interest rates and spreads and the liquidity model), public market prices, and specific risk premia. Our liquidity model is designed to capture the characteristics typical of past liquidity events, including increased exposure to a single risk factor, the severity of global economic downturns, and anticipated recovery trajectories. By incorporating the liquidity component into asset simulations, the model produces an asymmetrical ex-ante return distribution with a higher likelihood of extreme negative returns. Because such liquidity events are rare, a cursory analysis may not reveal significant differences in summary statistics such as

averages and standard deviations. However, a detailed examination of the left tail of the ex-ante return distribution highlights that potential drawdowns are amplified, resulting in larger losses with higher probabilities across multiple asset classes.

Figure 1: Capital Market Assumptions for main asset classes as of June 2025

Asset Class	10-Year Geometric Expected Return	Volatility (Smoothed)	Volatility (Unsmoothed)
Private Equity USD	10.6%	11.3%	19.1%
Private Debt USD	7.1%	6.0%	10.5%
Real Estate USD	5.7%	10.4%	12.2%
Equity Allocation USD	7.2%	17.9%	
Fixed Income Allocation USD	5.1%	5.8%	
USD Cash	3.2%	0.8%	

Source: Amundi Asset Management, CASM model, June 2025, the risk of private assets is calibrated on the original – smoothed – and the unsmoothed timeseries. Private Equity is a blend of Europe and US Buyout and Venture Capital. Private Debt is a blend of US and Europe direct lending, its estimates are hedged. Real Estate is a blend of Europe and US all property real estate equity. Equity allocation is a blend of MSCI World and MSCI Emerging markets based on custom weights. Fixed Income allocation is a composed of Global aggregate, Global High yield and EM Hard Currency debt with custom weights, its estimates are hedged. Forecast returns are not necessarily indicative of future performance, which could differ substantially.

Portfolio implementation and monitoring

On the portfolio implementation and monitoring front, challenges arise from differing valuation frequencies and reporting lags for private asset indices relative to public markets. Consequently, composite benchmarks blending private and public indices often lack timeliness and precision for short-term monitoring. Institutional investors frequently adopt proxy benchmarks combining public market indices with added illiquidity premia to approximate expected returns and risk profiles, enabling more transparent and frequent performance assessment while recognizing their limitations over the full investment horizon. This pragmatic approach facilitates dynamic portfolio oversight until private allocations mature, acknowledging the inherent trade-offs between measurement accuracy and liquidity constraints in managing diversified multi-asset portfolios inclusive of private assets.

2 | How to build and maintain allocation targets to private assets

The integration of private assets into institutional investment portfolios necessitates a sophisticated and rigorous approach, combining quantitative analytics with qualitative judgment to navigate their unique characteristics and risks. Unlike public assets that trade in liquid markets, private assets are illiquid, involve drawdown fund structures, and display distinct cash flow dynamics such as the J-curve effect. Successfully setting and maintaining an allocation target to private assets thus requires advanced modelling frameworks, comprehensive cash flow management, and detailed commitment strategies to optimize exposure and manage liquidity risks over time. In this section, we explain how to set investment goals for private assets in a mixed portfolio. We then discuss the drawdown process and J-curve effect, ending with strategies for committing to investments and their pros and cons.

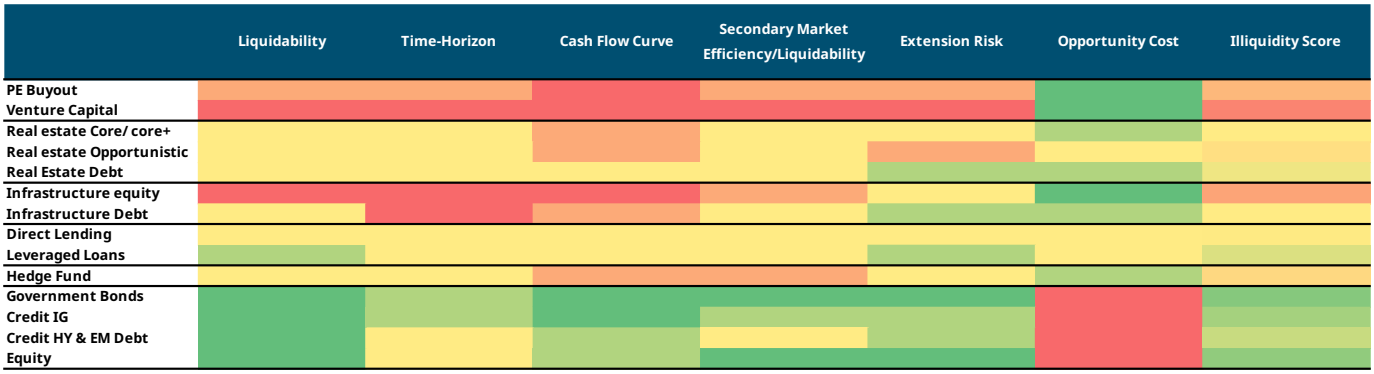
2.1 Defining a target allocation which includes private assets

The foundational step in allocating to private assets involves aligning investor risk preferences and liquidity tolerances with nuanced economic and statistical models. Due to the illiquid and non-normal return profiles of private assets, classical mean-variance optimization frameworks are insufficient; Conditional Value-at-Risk (CVaR) and stochastic simulations are employed to capture tail risks and asymmetric return distributions more effectively. These models incorporate "unsmoothed" private assets return data to better reflect true volatility and correlation structures. Additionally, investors' illiquidity preferences—measured through factors such as liquidation timing, secondary market efficiency, and extension risks—are incorporated via penalty terms to attitudes towards illiquidity in portfolio optimization. This hybrid quantitative-qualitative framework acknowledges constraints specific to large investors, such as diminishing marginal returns to private equity, implementation challenges (legal, operational expertise), and bespoke investor mandates.

There are several characteristics defining the illiquidity level of various asset classes. These factors do not specifically refer to trade frequency, hence they apply not only to private assets, but also to public ones. A description of these factors is outlined below:

- **Liquidability**: time to receive capital after the selling decision date.
- **Time-horizon**: for liquid assets, it refers to an investment horizon linked to a sufficiently high probability of achieving positive return. For unlisted, it refers to the generally stated maturity of the investments.
- **Cash Flow curve**: weighted average time to receive income/capital back under the form of distribution
- **Secondary market efficiency**: ability to find buyers in the secondary market at reasonable pricing
- **Extension risk**: risk of exceeding the initially planned investment horizon/maturity
- **Opportunity cost**: compensation to investors under the form of extra return for not being able to allocate to other opportunities

Figure 2: Assets illiquidity scorecard

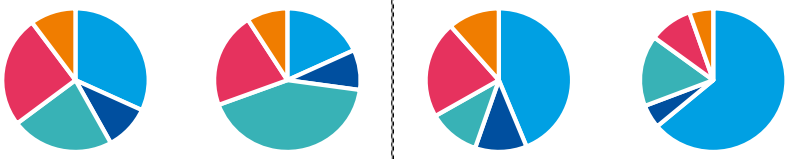


Source: Amundi Quant Solutions. Red means high illiquidity score, green means low illiquidity score. The content is for illustrative purposes only.

In simple terms, the scores for each characteristic help determine how hard it is to sell an asset quickly. When advising clients on asset allocation, we need to understand how much they care about liquidity. Knowing how investors value liquidity helps us make better decisions about asset allocation, especially when mixing assets with different liquidity levels. By changing how much illiquidity risk investors are willing to take, we guess how often they need to raise money to meet cash needs. A high illiquidity risk appetite means investors don't need liquid capital often. Instead of setting strict limits on private asset allocation, we consider the illiquidity profile in our goals using a penalty term. This helps us adjust the allocation to match investors' illiquidity preferences and be more flexible with each asset class. Analysing different levels of illiquidity risk helps align asset allocation with investors' goals and risk tolerance, improving their chances of long-term financial success. We define the illiquidity appetite with the investor, and using the illiquidity score for each class, we can suggest a target allocation to private assets that fits our clients' needs. Our previous research showed that for investors with low market risk appetite, increasing illiquidity appetite only slightly increases allocation to illiquid assets. This means that the volatility risk budget is the main factor in investment decisions for moderate-risk profiles. However, when the volatility risk budget increases, allowing for more illiquidity risk, it leads to more significant allocation changes. The overall exposure to private assets roughly doubles, and return prospects could improve by 60 bps per annum.

Figure 3: Optimised allocations with different illiquidity appetites

Investor Currency	US Dollar			
Market Risk Budget	6% Volatility		12% Volatility	
Illiquidity Appetite	Medium	High	Medium	High
	Allocation Statistics			
Geometric Exp. Return	6.0%	6.0%	7.3%	7.9%
Exp. Volatility	6.0%	6.0%	12.0%	11.9%
Sharpe Ratio	0.46	0.46	0.34	0.39
CVaR 95%	7.9%	7.8%	18.4%	18.6%
P(Ret < 0) at 10-Year	0.1%	0.1%	1.7%	1.1%
	Allocation Composition			
Global Aggregate	50%	48%	14%	14%
EMBI & Global HY	20%	20%	21%	21%
DM Equity	8%	8%	36%	20%
EM Equity	2%	2%	11%	6%
Real and Alternative Assets	20%	22%	18%	38%
	Real and Alternative Assets Breakdown			
Global PE				
Global Real Estate				
Infrastructure Equity				
Global Private Debt				
Hedge Funds				



Source: Amundi Quant Solutions based on CASM model simulations and POwR optimiser. Data as of 30 January 2025. Efficient frontiers are obtained by minimising portfolio CVAR, while respecting diversification constraints and the investor's liquidity preference. Frontiers may exhibit irregular patterns when plotted in the mean-volatility space. Forecast returns are not necessarily indicative of future performance, which could differ substantially.

Interaction between risk and illiquidity appetite

The interplay between risk tolerance and illiquidity appetite is multifaceted—liquidity needs driven by liability matching, behavioural biases, regulation, and market opacity can disrupt expected linear relationships. Effective allocation strategies thus require customization of illiquidity targets based on investor specific time horizons, cash flow constraints, and regulatory frameworks. Therefore, not all high-risk investors have high illiquidity appetites, and not all conservative investors avoid illiquidity. In conclusion, better predictors of illiquidity tolerance are the time horizon, cash flow needs, and investment objectives, in addition to tolerance for volatility or drawdowns.

2.2 Balance sheet mechanics of private assets drawdown funds

Investors can access private assets through various investment vehicles. Each structure presents different characteristics in terms of cash flow patterns, risks, and performance. The choice between these structures often depends on factors such as diversification needs (J-curve or managers risks), available resources, and the investor's level of experience.

In the following paragraphs, we assume that investors plan capital commitments to classic fund structures. This modelling choice allows us to capture the nuances of the self-liquidating nature of these assets in the context of a multi-asset portfolio that includes listed assets and why planning and cash flow management are of paramount importance for any asset allocator of a broad investment program.

Cashflows dynamics and revisited Takahashi and Alexander model

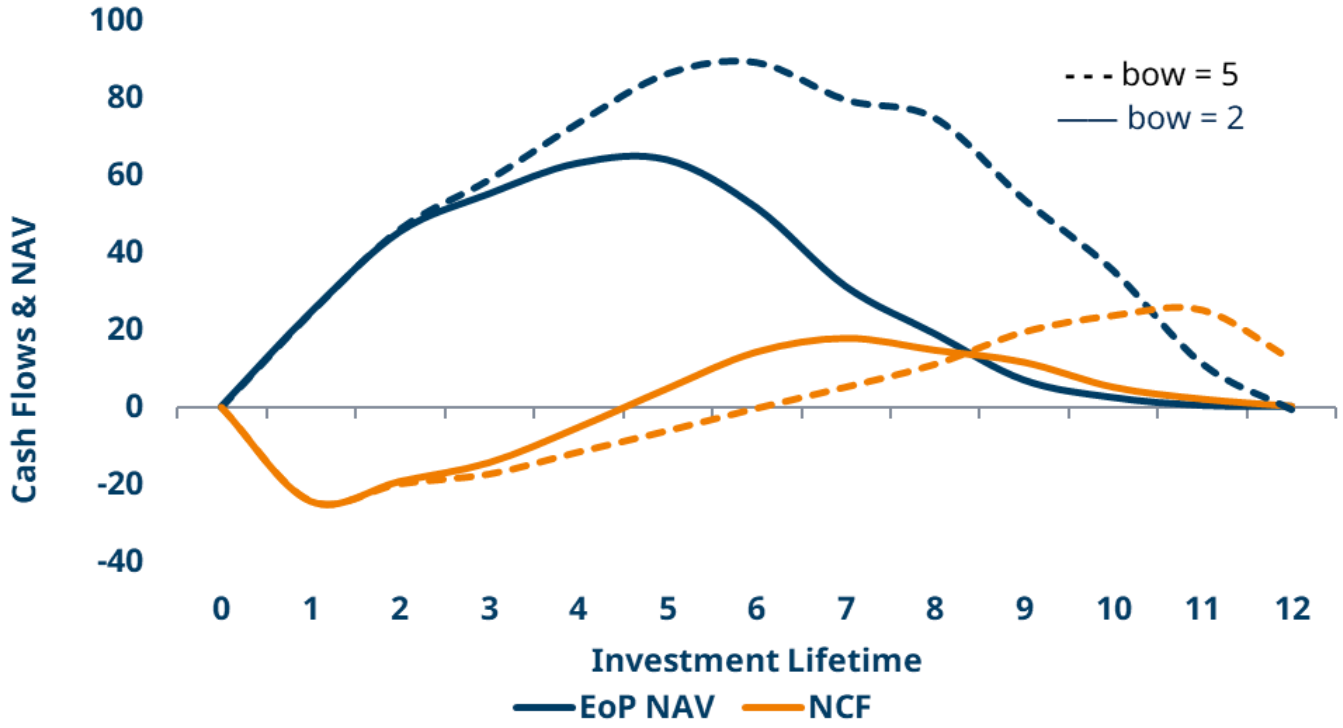
Even if the growth of semi-liquid funds (also known as evergreen) is pronounced, private asset investments are still predominantly accessed via drawdown fund structures, characterised by periodic capital calls in the investment phase, followed by distributions in the disinvestment one, generating a J-curve effect on returns. Takahashi and Alexander (2001) introduce a model which remains a standard tool to simulate these dynamics by modelling capital calls as a function of uncalled capital and contribution rates and capital distributions determined by fund age, return growth, and a 'bow' parameter that shapes the timing of distributions.

The TA model introduced in this framework is revisited to integrate stochastic asset return forecasts calibrated to "smoothed" IRRs, balancing realism in NAV projections without artificial volatility spikes. This allows for refined estimation of NAV trajectories and cash flow schedules, critical for commitment planning and liquidity forecasting. Empirical calibration leverages extensive private asset cash flow data sets (e.g., MSCI Burgiss and proprietary expertise) to fine-tune bow parameters and contribution rates, reflecting different asset class liquidity and maturity profiles.

The impact of bow on the cash flow curve

A hypothetical private equity fund investment example illustrates these dynamics. We assume no growth rate and different bow parameter to explain the investors experience in terms of exposure to private equity, represented by the average NAV over the fund's lifetime, and how quickly they can expect to receive the capital back. With a bow parameter of 2, the Weighted Average Life (WAL) is 6.8 years, the average NAV as a percentage of commitment is 30%, and the maximum NAV reaches 64% around year 5. In contrast, with a bow parameter of 5, the WAL increases to 9.7 years, the average NAV as a percentage of commitment rises to 53%, and the maximum NAV reaches 90% around year 6. This example highlights how the bow parameter affects the timing of capital distributions and NAV evolution, necessitating different commitment strategies to maximise investors financial objectives.

Figure 4: The impact of bow on the distributions and NAV projections



Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes.

2.3 Planning capital commitments to maximise exposure objectives

The research on commitment strategies for private assets is not as extensive as for other investments. De Zwart, Frieser, and Van Dijk (2012) created simple methods to decide how much to commit to private equity funds each year. They based these methods on investment levels and uncalled capital. Oberli (2015) expanded on this work to include multiple assets. Kieffer, Meyer, Gloukoviezoff, Lucius, and Bouvry (2023) used computer simulations to show that flexible overcommitment strategies, which do not rely heavily on cash flow predictions, are better than those by De Zwart et al. (2012). Another key study by Brown, Harris, Hu, Kaplan, and Robinson (2018) showed that past fundraising information can help in a dynamic approach. They found that high fundraising periods often lead to low returns, so commitments should be lower then. However, they noted only small benefits from this approach because investors struggle to time their commitments. Practitioners suggest simpler methods like using a percentage of unallocated capital or cash flow matching, which are better for most investors planning a private asset program. The goal of this paper is to provide a straightforward framework to institutional investors for thinking about long-term commitment planning in the context of integration of private assets into a multi-asset portfolio.

The definition of a commitment plan is often understated, but it is necessary to maximise the chances of achieving expected financial outcomes. In this section, we evaluate different commitment strategies based on several key considerations and objectives. The main goal can be a quick accumulation of the private asset position (for investors approaching ex-novo the asset class) or maintaining the exposure as close as possible to the target weight. The secondary objectives are as follows:

- **Diversification across vintages and managers as an essential tool to mitigate risks**, first and foremost, those associated with business cycles, and second, to operational and human biases.

- **Sustainability of recommitments from a liquidity perspective**: The timing of capital calls and distributions is crucial to avoid failure to meet contract obligations and allocation drifts.

Designing a commitment plan must start with identifying the investor's status quo and preferences. This allows for a proper trade-off in each case. In this study, we differentiate between investors approaching private assets for the first time (hence, with zero starting allocation and needing to ramp up their exposure) and those with an existing stack of private asset commitments. The former might be more willing to speed up capital allocation at the expense of the other objectives. The latter, on the other hand, might represent investors already exposed to private assets or those pursuing a strategic allocation change (i.e., setting a new private asset target exposure) who are perhaps more inclined to define recommitments as sustainable and avoid liquidity events while keeping allocations as close as possible to the targets.

For sake of simplicity, we assume that the institution we are advising is a US dollar investor with a dynamic volatility budget (12%) and a medium illiquidity risk appetite. We have already defined the strategic allocation for this investor, close to a 60/40 profile but enhanced with an exposure to private assets of 18% (Figure 3). Investors need assistance in planning future commitments to private asset funds to maximise their chances of reaching and maintaining target exposure without incurring excessive liquidity shortfalls. In this analysis, we keep the assumptions behind the functioning of the TA model constant across different investments. Hence, the bow parameter and rate of contribution for private assets are the same across different yearly commitments (Figure 5 provides the parameters used).

The staggered profile of capital calls and the self-liquidating nature of private asset drawdown funds require institutions to decide how much and how often to invest. Another key decision is how to handle capital that has not been used yet. After making a commitment, investors need to think about the contract that lets the General Partner (GP) ask for money as agreed. Limited Partners (LPs) must have capital ready to avoid defaulting on the contract. So, planning commitments means finding a balance between losing performance by keeping money uninvested and the cost of quickly getting more money if needed. To explain how a commitment plan works, we first make simplifying assumptions such as assets give steady returns based on our capital market assumptions updated by June 2025. Later, we make it more complex by considering time and scenario dimensions. We also assume that the private assets target is fully deployed in private equity, and unallocated money is parked into listed equity, which is similar to private equity in terms of risk exposures. Other ways to invest unused money will be discussed, looking at their pros and cons, in the next part of the paper.

Figure 5: Rate of contributions and bow parameters for various representative asset classes

Asset Structure Type	Private Equity Drawdown Fund	Real Estate Equity Drawdown Fund	Private Debt Drawdown Fund	Listed Asset
Expected Lifetime (years)	12	10	8	
Bow	3.5	1.8	2.3	100
Year	Rate of Contribution (as % of Commitment)			
0	0%	0%	0%	100%
1	24%	34%	35%	0%
2	20%	22%	22%	0%
3	19%	15%	15%	0%
4	14%	6%	6%	0%
5	9%	2%	1%	0%
6	4%	0%	0%	0%
7	2%	0%	0%	0%
8	1%	0%	0%	0%
9	1%	0%	0%	0%
10	0%	0%	0%	0%

Source: Amundi Quant Solutions based on MSCI Burgiss data, June 2025. Bow for listed assets is 100 as the capital distribution, excluding any yield or coupon, happens at the very end of the holding period.

Commitment approaches for investors building the allocation to private assets

Our framework assumes that investors commit to new private asset funds with an annual frequency. Moreover, they settle the private asset fund cash flows using previous investment distributions and undrawn capital invested in liquid assets. Once GPs calls and distributions are taken care of, investors tackle the allocation rebalancing, which happens every year and only for the liquid portion of the portfolio. The commitments and rebalancing frequency are easily adaptable to investors' needs. In this section, we assume that the investor has no legacy private assets NAV and wants to build exposure as quickly as possible to reach the target of 18% to minimise returns drag versus the benchmark set.

BOX 2: Examples of simple private equity commitment pacing

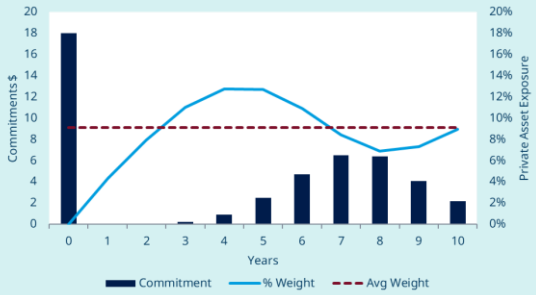
A commitment strategy that invests an amount equal to the target private assets NAV (e.g., $18 out of $100) initially seems aggressive but results in lower actual exposure to private equity over ten years—about 9% instead of the 18% target. This happens because private equity NAV grows quickly when capital is called but later declines as distributions exceed new commitments. Additionally, based on this example investors face a two-year period post-initial commitment with no capital to invest, leading to underexposure and poor vintage-year diversification.

An alternative strategy splits the total commitment into three equal annual investments and reinvested distributions from year 4.This is improving vintage-year diversification but still falling short of the 18% exposure target and resulting in a slightly lower average NAV.

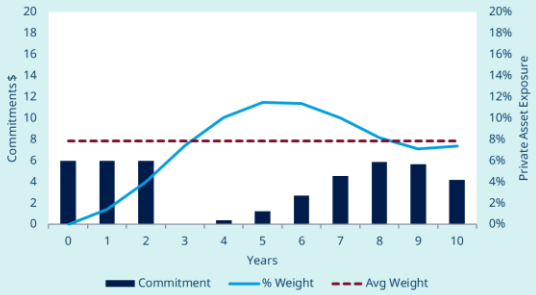
Overall, these simple commitment strategies are inadequate for investors aiming to increase private asset allocation, as they fail to ensure target exposure and consistent market cycle coverage, largely due to the self-liquidating nature of private equity funds.

Figure 6. Examples of a Private Equity commitment plan

A. Initial commitment equal to the target allocation plus future distributions



B. Three annual commitments the sum of which equals the target allocation plus future distributions



Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes.

To achieve the investor's objectives in terms of exposure and vintage diversification, a continuous and periodical commitment strategy must be planned. As a result, two additional approaches might be useful for investors to address the challenges outlined above. These consist of committing an amount of capital every period, proportional to specific metrics.

1. **Unallocated capital** (Unallocated or uncommitted capital approach). A private asset program can be considered as the sum of Net Asset Value (i.e. , the amount of capital that is called and invested in private equity) and capital waiting for being called or unallocated (which is generally invested in liquid assets or parked into cash or money market instruments). Unallocated capital is reduced every period by new commitments and augmented by net distributions.

2. **Target exposure** to private asses (NAV-based approach). In our case, this is the private equity NAV derived by multiplying the strategic asset allocation private equity weight by the beginning-period portfolio asset under management.

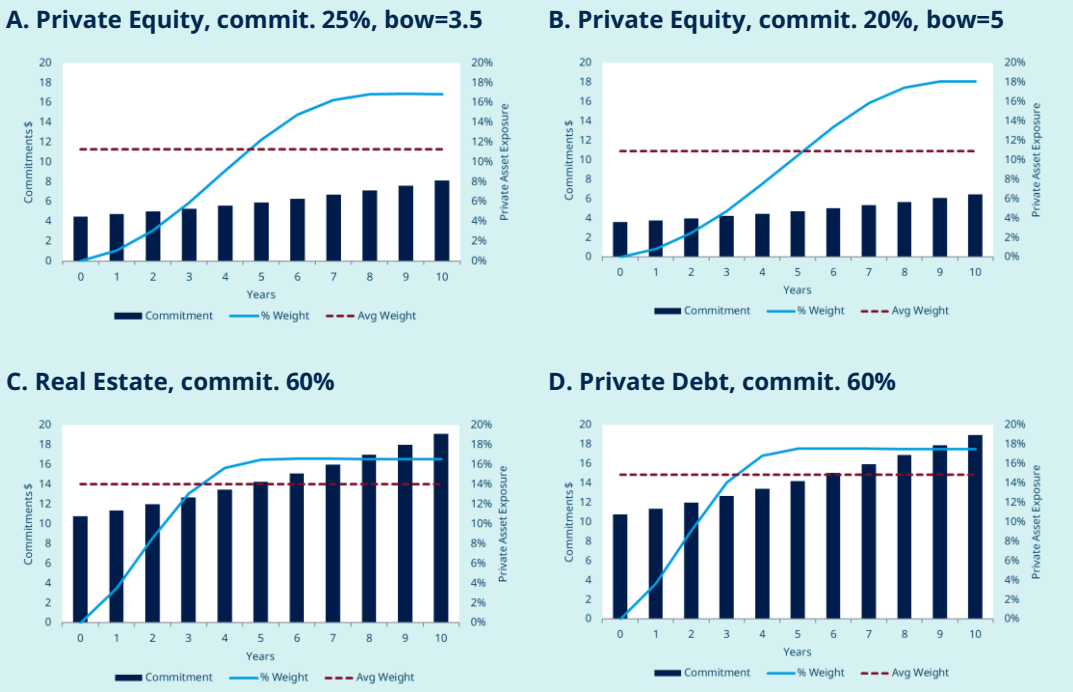
The next box highlights the main differences in terms of commitments amounts and proportion of capital recommitments for different asset classes.

BOX 3: NAV-based approaches differ based on the asset class characteristics

The amount invested in private assets is influenced by the expected timing of capital returns and anticipated profits. Illustrative examples demonstrate that, while targeting an 18% allocation to private assets overall, the annual investment amounts vary according to the expected profitability of private equity and other asset classes. Specifically,

Figure 7. Examples of private asset commitment programmes for different asset classes.

Every year we assume to re-commit to the asset class a fixed percentage of the target allocation (NAV-based approach).



Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes.

committing each year 25% of target private equity allocation proves effective, achieving approximately 16% exposure by year six and maintaining that level thereafter. For real estate and private debt, more aggressive commitments are often necessary due to their shorter contribution periods and lifespans. Empirical evidence suggests that aiming for 60% of total investments in these asset classes yields the desired exposure. Under these strategies, private assets constitute on average 14% to 15% of the portfolio over the first decade. These outcomes are contingent on assumptions regarding asset growth and cash flow profiles. For instance, adjusting the expected distribution for private equity to target 20% of total investments results in comparable exposure, reaching a stable level by year nine with a slightly reduced average investment of 10.9%.

Commitments in private equity and private debt tend to be lower initially because their distributions materialise later in the investment horizon and capital calls take place in the initial years. In contrast, real estate typically offers lower returns, faster distributions which may justify higher commitment levels compared to private debt to keep the NAV afloat.

However, LPs often monitor the unfunded commitments over consecutive years. In Figure 8, we zoom into the two private equity cases and compare the ratio of total unfunded commitments to the target private equity NAV at year 10. In case we expect private equity funds to experience backloaded distributions (bow of 5), investors could commit less aggressively as the capital will remain in the ground for longer. Hence the cumulated unfunded commitments over 10 years would be 56% of the target NAV versus 70% in case of a bow at 3.5.

Figure 8. Summary statistics of NAV-based strategies for different private assets in a deterministic setting

Asset	NAV-based Commitment Strategy (f)	Years to stabilise	Average private assets	Cum. Comm.*	Unfun. Comm.**	Average listed assets
Private Equity (bow=3.5)	25%	7	11.3%	2.06	0.70	88.7%
Private Equity (bow=5)	20%	9	10.9%	1.65	0.56	89.1%
Real Estate	60%	5	14.0%	5.02	1.94	86.0%
Private Debt	60%	5	14.9%	5.04	1.85	85.1%

Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes. Years to stabilise refers to the number of years the investor would need to wait in order for the PE weight rate of change to be reasonably flat. Average PE or listed assets weights is the weight mean calculated over the next 10 years. * Cumulated Commitment over 10 years as % of target weight. **Unfunded Commitments reflect cumulative commitments over 10 years net of capital called. Average listed assets exposure over 10 years

The illustrative examples underscore the necessity for meticulous planning in private asset investments to approximate the intended exposure, acknowledging that exact alignment with target weights may not always be feasible. Public asset valuations can exhibit greater volatility relative to other portfolio components, and disparities in asset pricing methodologies can induce significant exposure fluctuations, a phenomenon referred to as denominator effect risk. Furthermore, actual cash flows from private funds may deviate from projections, potentially compelling asset allocators to liquidate other assets to satisfy unforeseen capital calls, particularly during adverse market conditions.

To rigorously analyse these complexities, a proprietary simulation tool (CASM) is employed to model the uncertainty inherent in various commitment strategies and asset classes. This approach facilitates evaluation of the impact on overall portfolio returns, the frequency with which private asset allocations surpass target thresholds—potentially necessitating distress sales—and the requisite adjustments in planning responsive to evolving market environments.

The study examines multiple commitment strategies targeting an 18% allocation to private equity, wherein the investor commits a fixed proportion (f) annually, either of the target exposure or of the remaining unallocated capital. The proportions considered include 15%, 20%, 25%, and 30% of the target NAV, alongside 50%, 100%, and 150% of unallocated capital.

Findings indicate that an annual commitment of 25% of the target NAV most effectively achieves and maintains exposure proximate to the target, stabilising from the seventh year onward. Lower commitment rates tend to result in persistent underexposure, whereas a 30% commitment rate leads to an average exposure exceeding the target, thereby potentially breaching established risk parameters. For unallocated capital approaches, the target or maximum exposure is reached by year 4, but NAV drops in later years. This happens because uncommitted capital decreases as new investments are made, and returns from earlier investments do not come in fast enough. Over 10 years, the average NAV is slightly different from the NAV-based strategies. Figure 10 and 11 show that strategies using unallocated capital do not have stable NAV or good year-to-year diversification.

When deciding how to invest in private assets, it is important to check if the plan can keep up with cash needs. We compare different plans to see how likely they are to run out of cash. This happens when the money set aside and distributions from investments are not enough to pay for new calls. If a plan is too aggressive, it might run out of liquid capital more often. For example, a plan aiming for 25% of NAV has roughly 20% chance of running out of cash in any quarter. But if we look at bigger cash shortages, the chance drops to 8% for shortages over 25 bps of total assets and to 1% for those over 50 bps. These shortages usually happen in the second half of a 10-year period and last about three quarters. Figure 12 shows different percentiles of annual capital call shortfall as % of total portfolio over time for the 25% NAV-based strategy. The 1st percentile of the capital call annual overdrafts reaches 233 bps at year 6 and then declines to around 125 bps. To avoid defaults, investors might need to find cash in different ways. Some might sell other investments, other could convert physical exposure to traditional assets into synthetic.

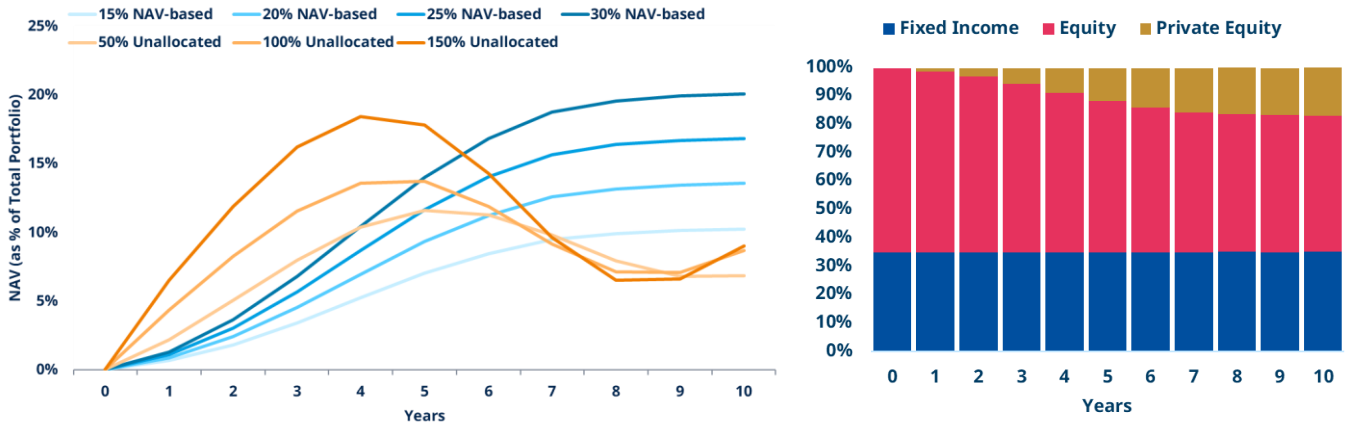
Figure 9. 10-year statistics of different commitment strategies to private equity for a multi asset allocation starting from zero exposure to private assets

Commitment Strategy (results over 10-year period)	NAV-based				Unallocated		
	15%	20%	25%	30%	50%	100%	150%
Geometric Return	6.98%	7.05%	7.12%	7.20%	7.01%	7.03%	7.09%
Volatility°	12.14%	11.96%	11.80%	11.72%	12.02%	11.89%	11.78%
Sharpe Ratio	0.33	0.34	0.35	0.36	0.33	0.34	0.35
Average NAV%	6.1%	8.2%	10.2%	12.2%	7.6%	9.0%	11.1%
Average Equity Weight	59.0%	57.0%	55.0%	53.0%	57.6%	56.1%	54.1%
Average Fixed Income Weight	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%	34.8%
Average Cash Weight	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Likelihood NAV% Weight in range°°	0%	7%	53%	54%	0%	0%	0%
Liquidity Shortfall Event Likelihood	0%	1%	22%	89%	0%	2%	53%
Average Liquidity Shortfall as % of Total Portfolio	-	-0.11%	-0.13%	-0.20%	-0.17%	-0.17%	-0.36%
Liquidity Shortfall Event Likelihood (> 25bps)	0%	0%	8%	63%	0%	1%	42%
Liquidity Shortfall Event Likelihood (> 50bps)	0%	0%	1%	26%	0%	0%	31%
Cumulated Commitments*	150%	200%	250%	300%	167%	210%	252%
Unfunded Commitments**	113%	150%	187%	223%	116%	146%	173%

Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes. °Volatility represents the standard deviation of the multi-asset allocation returns, assuming "smoothed" pricing for private equity. Hence, it represents a measure of accounting risk rather than economic risk.°°The range is defined as -/+2% around the target. * Cumulated Commitment over 10 years as % of target weight. **Unfunded Commitments reflect cumulative commitments over 10 years net of capital called.

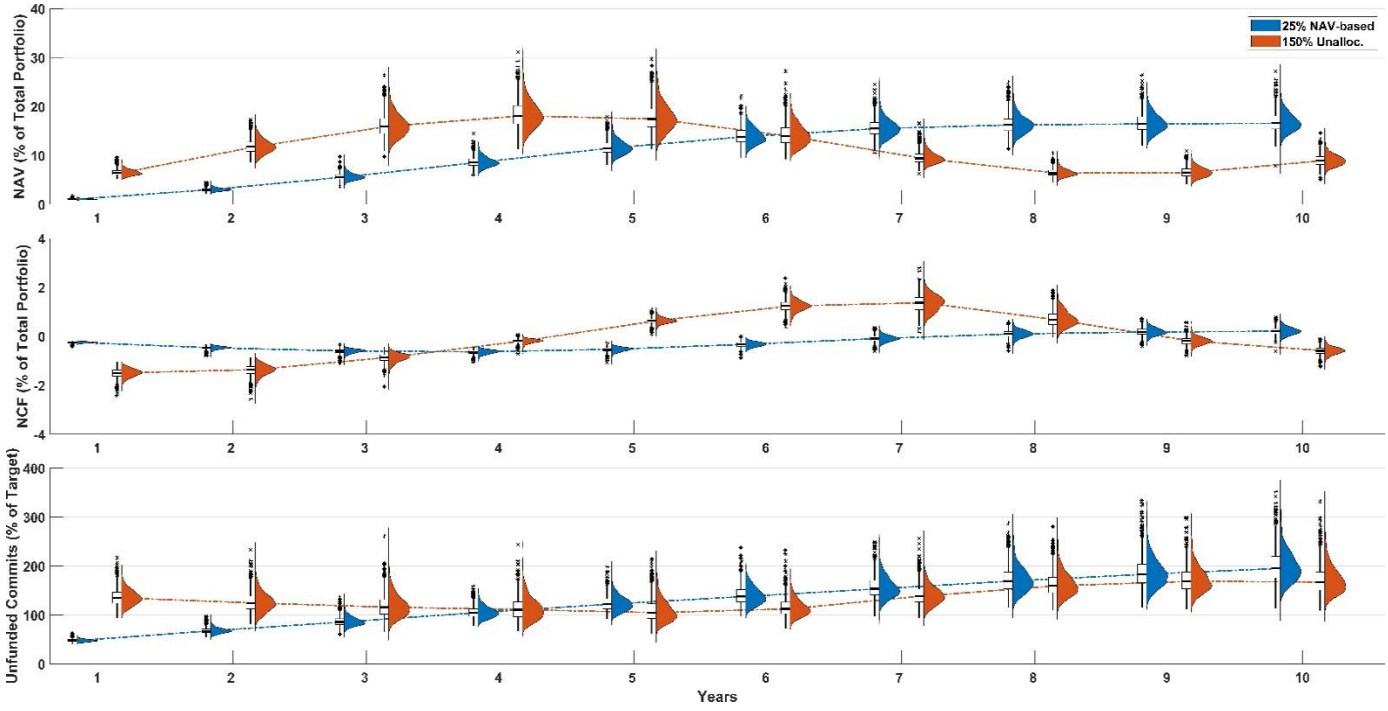
As we assumed the investor cannot sell in secondary markets their private assets exposure, hence cannot manage allocation drifts not even at a cost, it is worth thinking at the desired exposure to private equity as a range rather than a fixed weight defined by the SAA. From Figure 9, we can see that the 25% NAV-based is the only program which guarantees a sufficient number of scenarios with an exposure between 16% and 20% (the 30% strategy causes more scenarios to exceed the upper band). The other strategies either do not even reach the 50% over the period, or they are not capable of keeping this ratio around acceptable levels.

Figure 10. Average NAV as % of ending assets value across several simulations for different commitment strategies (left), average asset allocation weights for the 25% NAV-based strategy (right)



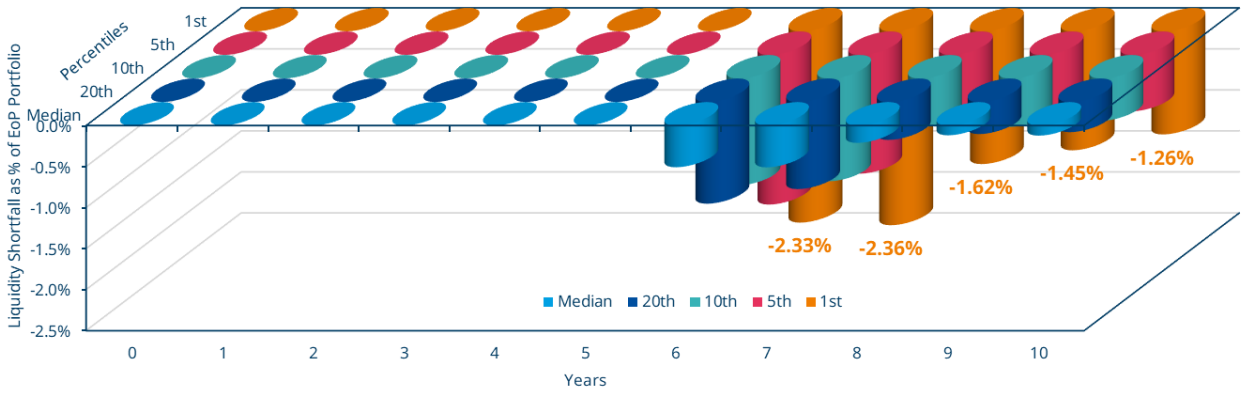
Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes.

Figure 11. Stochastic simulations of a Private Equity commitment program with 25% NAV-based, and 150% of Unallocated capital strategies. Private assets NAV as % of total portfolio (top), Net Cash Flow as % of total portfolio (middle), Unfunded commitments as % of target exposure (bottom)



Source: Amundi Asset Management, Multi Asset Quant Solutions calculations for illustrative purposes.

Figure 12. Percentiles of liquidity shortfall as % of end of the period portfolio, excluding scenarios where there is no liquidity event assuming a 25% NAV-based commitment strategy



Source: Amundi Asset Management, Multi Asset Quant Solutions calculations for illustrative purposes.

Notwithstanding the quickness of the unallocated capital strategy to reach the target exposure, it lacks in the ability to stabilise this exposure and regularly commit to new vintages, failing to optimally diversify over the market cycle curve. Additionally, to significantly elevate the average NAV over time, the investor would need to increase the percentage of unallocated capital to invest each year beyond 100%. This could trigger many instances whereby the capital calls faced are larger that the liquid assets at disposal and distributions.

For these reasons, we believe that committing each period a fixed portion of target NAV (between 20% and 25%) could represent the best approach to ramp up the allocation to private equity. This approach shows sufficient average exposure and time to reach NAV stability. Additionally, the liquidity issues frequency and magnitude appear to be acceptable and manageable with cash buffers and derivatives.

We conclude that a successful commitment program to build an allocation to private assets needs to carefully consider the expected cash flow curves of invested funds, the performance of these funds, also in relative terms with the remaining asset classes. From these considerations, each investor should weigh the importance of vintage year diversification, average exposure to the asset class over time and, finally, the potential liquidity stress each commitment plan could pose.

Investors already exposed to private assets

In the preceding section, it was demonstrated that commitment strategies involving annual investments of a fraction of the unallocated capital can accelerate the build-up of private asset allocations. However, such strategies struggle to maintain exposure close to the target and exhibit insufficient vintage year diversification.

In this subsequent analysis, the focus shifts to a scenario where the investor has already accumulated private asset exposure near the target allocation. The primary objective is to sustain exposure within an acceptable range while minimizing excessive liquidity events that could adversely affect the broader portfolio and relationships with General Partners (GPs).

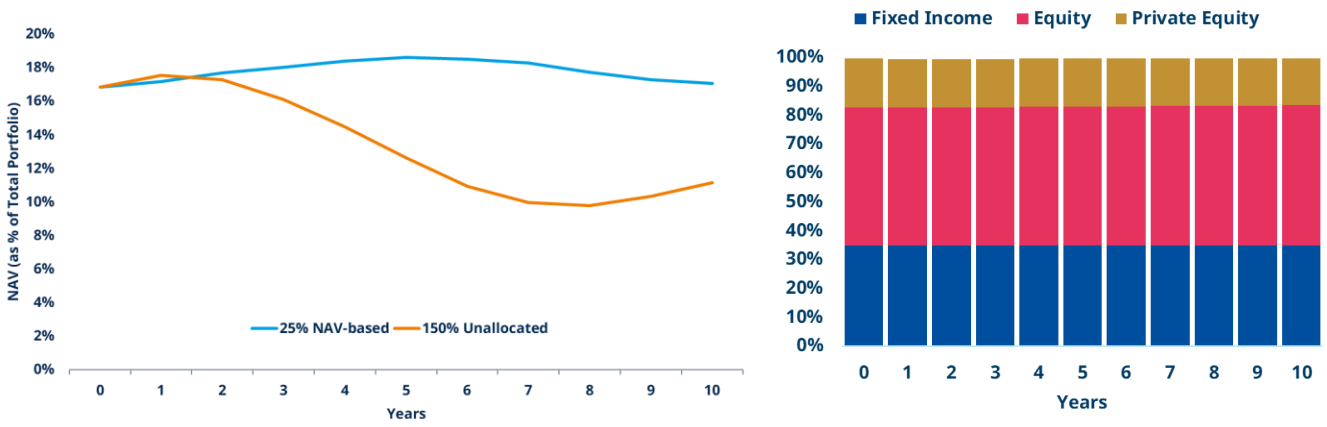
Two strategies are evaluated: a 25% NAV-based commitment, deemed reasonable for private equity based on prior findings, and a 150% unallocated Capital commitment. The results align with previous observations. The NAV-based strategy achieves acceptable private equity exposure within defined parameters. Although liquidity shortfall events occur frequently, their severity remains moderate when considering magnitude. At the ten-year mark, unfunded commitments amount to 1.7 times the target exposure, while cumulative commitments reach 2.3 times the target NAV, indicating a necessity to over-commit to private equity to realise anticipated benefits within a multi-asset portfolio. Conversely, the unallocated capital-based strategy fails to deliver stable exposure outcomes, with cash flows and NAV projections remaining largely stagnant due to irregular commitment patterns. These conclusions assume the legacy private equity commitments portfolio is balanced, such that projected capital calls and distributions maintain a stable NAV trajectory. Outcomes may vary if the profile of recent commitments differs.

Figure 13. 10-year statistics of different commitment strategies to private equity for a multi asset allocation with an existing exposure to private assets

Commitment Strategy (results over 10-year period)	25% NAV-based	150% Unallocated
Geometric Return	7.35%	7.17%
Volatility°	11.37%	11.60%
Sharpe Ratio	0.38	0.36
Average NAV%	17.9%	13.4%
Average Equity Weight	47.3%	51.8%
Average Fixed Income Weight	34.8%	34.8%
Average Cash Weight	0.0%	0.0%
Likelihood NAV% Weight in range°°	40%	1%
Liquidity Shortfall Event Likelihood	75%	0%
Average Liquidity Shortfall as % of Total Portfolio	-0.07%	-
Liquidity Shortfall Event Likelihood (> 25bps)	3%	0%
Liquidity Shortfall Event Likelihood (> 50bps)	0%	0%
Cumulated Commitments*	227%	120%
Unfunded Commitments**	172%	99%

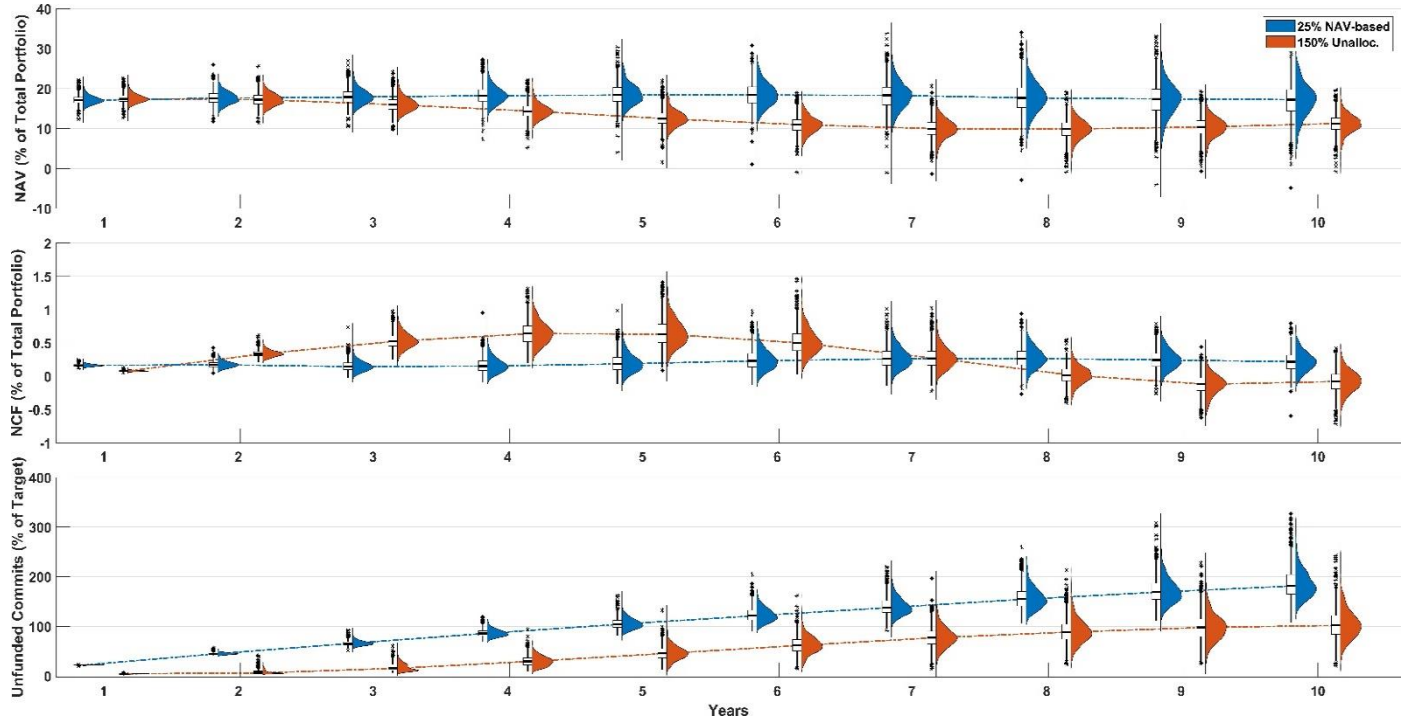
Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes. °Volatility represents the standard deviation of the multi asset allocation returns assuming "smoothed" pricing for private equity. Hence it represents a measure of accounting risk more than economic risk.°°The range is defined as -/+2% around the target. * Cumulated Commitment over 10 years as % of target weight. **Unfunded Commitments reflect cumulative commitments over 10 years net of capital called.

Figure 14. Average NAV as % of total portfolio AuM (left) and average allocation projected over the next 10-years for the 25% NAV-based strategy



Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes.

Figure 15. Stochastic simulations of a Private Equity commitment program with 25% NAV-based, and 150% of Unallocated capital strategies. Private assets NAV as % of total portfolio (top), Net Cash Flow as % of total portfolio (middle), Unfunded commitments as % of target exposure (bottom)



Source: Amundi Asset Management, Quant Solutions calculations for illustrative purposes.

Expertise in pacing private assets, investment planning, and commitment strategy is increasingly important as traditional asset-allocation processes evolve toward more flexible, target-driven mixes of asset classes. Regardless of approach — whether SAA, as used in this paper, or the Total Portfolio Approach at the other extreme — investors need robust pacing and cash-flow management to achieve their intended outcomes. Additionally, as alternative asset classes bridge into the retail world of retirement solutions, extra care and precision need to be deployed as retail investors are not yet educated and ready to experience stress and liquidity shortfall when it comes to life needs.

Opportunities and risks of overcommitting

We outline how investing in private assets requires investors to overcommit to achieve target exposure. A well-structured commitment strategy helps to balance the need for liquidity with the desire to maintain exposure to private assets. If an investor overcommits without sufficient liquidity or tools to generate it, they may face shortfalls when capital calls occur, leading to potential disruptions in their overall investment strategies. In summary, the interplay between drawdown mechanisms, commitment strategies, and liquidity needs underscores the importance of a disciplined approach to pacing and commitment planning for private assets investments. This approach helps ensure that investors can effectively manage their portfolios while navigating the complexities of private asset cash flows.

3 | Solving the undrawn capital dilemma

One of the most frequent questions when constructing a portfolio that includes private assets is how to utilise the capital that has been committed or will be committed soon before the underlying funds call it to work. The process of deploying money to private asset managers can take a few years, and it is not always easy to forecast, as it depends on the underlying available opportunities. However, capital is often requested on short notice, and to avoid penalties, the call should be met, hopefully without major allocation drifts.

To tackle the problem efficiently, it is paramount to have a holistic approach and correct implementation of the liquid component that should, on one hand, target portfolio objectives and, on the other, support a smooth construction of the private component. A typical hurdle an investor might encounter is a situation where the committed capital is invested in an equity portfolio, and subsequent to a market drop of 20%, the liquidity needed to fund the calls is withdrawn from other areas of the portfolio, causing an unwarranted tilt in the asset allocation. Certainly, there is no one-size-fits-all solution, as the appropriate methodologies depend on portfolio characteristics and the investor's profile. A consistent solution should consider three main priorities

- Before being drawn into the private strategy chosen, the money should in any case be put at work, in order to receive an acceptable return. The economic reward will depend on the instrument and strategy chosen, but at least it should have a spread above cash. Given where yields and inflation are today, cash or deposits are not a viable option;

- When called, the capital should be readily available, to avoid shortage of liquidity and potential penalties imposed by the managers. As the capital should be at disposal also with short notice, the strategy should go hand in hand with an efficient planning and forecast in order to have a projection of when the amounts will be needed;

- Similar to the point before, the request of capital should not cause allocation drifts vs the target allocation of the overall portfolio. If the forecasting of cash outs were not properly addressed, this would cause allocation imbalances or unwarranted risk concentrations (i.e. forced to sell defensive securities).

From an asset allocation standpoint, there are several approaches that an investor can take, depending on their portfolio objectives, approach to risk, funding source of the investor and the specific profile of the private investments targeted. We can in theory break it down in three separate blueprints:

- **Cash Enhancement Strategies** aim for steady returns with controlled risk. They invest in a liquid portfolio that targets a set level of risk or loss (like low-risk hedge funds or stocks). These strategies suit investors who want to earn on unused cash without risking much. The benefits include easy investment, low connection to other investments, and the ability to aim for a specific risk or return level. However, many strategies need to be combined to reduce risks. This works best when market conditions are stable and is ideal if the invested amount is small compared to the total portfolio. Investors should understand long-short strategies, often used in these low-risk investments.

- **Proxy Beta Strategies** aim to copy the returns of private assets. They invest in a liquid portfolio that acts like these private assets. For example, they use equity indices with derivatives or credit indices with leverage. These strategies suit asset owners who can handle high risk and want returns similar to private assets. They are also for institutional clients who need specific returns for financial goals. The benefits include the chance for good returns, though with higher risk. They work well for portfolios with small private asset allocations and are more efficient when borrowing costs are low. This is the approach used in our previous analysis.

- **Asset Allocation Strategies** focus on how to allocate investments. One way is to copy the mix of a liquid portfolio, like 60% in stocks and 40% in bonds. Another way is to invest based on when money is needed. For example, invest in bonds for short-term needs and in stocks for long-term needs. This helps ensure money is available when needed and can capture the premiums available on the markets. These strategies suit investors who can handle some risk and want returns similar to their liquid portfolio. The liquidity portfolio is designed to match the client's overall investment plan. This approach balances risk and is simple. It works well for those investing extensively in private assets. However, the timing-based approach needs a clear plan and accurate predictions of when money will be needed.

These methodologies mainly apply to long-term assets like private equity and infrastructure. For shorter-horizon segments such as private debt or direct lending, the impact of undrawn capital is less significant due to quicker capital deployment. Additionally, investors may use semi-liquid evergreen structures, where capital is deployed upfront, making the discussed portfolio construction considerations less critical.

Conclusion

Private assets have become a vital component of modern multi-asset portfolios in response to shrinking and increasingly concentrated public markets. They provide access to a broader and more diverse set of investment opportunities, including private companies that drive economic growth but are unavailable through public markets. The unique features of private equity, private credit, infrastructure, and real estate, such as illiquidity premiums, low correlation with public markets, and inflation hedging, offer valuable diversification and the potential for enhanced risk-adjusted returns. However, these benefits come with challenges, including illiquidity, long investment horizons, and the need for specialized expertise in portfolio construction and risk management.

A disciplined strategic asset allocation (SAA) process is essential before committing capital to private assets. This process aligns private investments with the overall portfolio objectives, liquidity needs, and risk tolerance. Importantly, investment planning and implementation should be integrated rather than treated separately, as commitment decisions directly affect portfolio outcomes and liquidity management decisions.

Private assets are typically valued using internal rate of return (IRR) metrics, which can mask true volatility and correlations due to smoothing effects and infrequent pricing. Advanced modelling techniques that incorporate unsmoothed returns, liquidity risk, and tail risk are necessary to better capture the risk-return profile. Incorporating liquidity preferences at both the asset class and investor levels, further strengthens allocation decisions.

The cash flow dynamics of private assets, characterised by J-curves and drawdown fund mechanics, require carefully designed commitment pacing strategies. These strategies balance capital calls and distributions to maintain target exposures while managing liquidity constraints and minimizing forced asset sales during periods of market stress. Staggered commitment plans based on a fixed percentage of the evolving net asset value (NAV), typically around 20-25% annually enable investors to ramp up their exposure efficiently, diversify across vintage years, and maintain liquidity stability. This NAV-based approach outperforms methods based on unallocated capital for new and existing private asset investors.

While necessary to achieve target exposure, overcommitment must be carefully calibrated to avoid liquidity risks from accelerated capital calls or slowed distributions. Managing undrawn capital, committed but uncalled funds, is equally critical. Strategies such as cash enhancement, proxy beta replication, and liquid asset alignment help balance return generation with liquidity needs, thereby reducing the risk of forced asset sales or portfolio drift.

Successful private asset allocation requires a comprehensive approach that combines rigorous quantitative modelling, qualitative judgment, and investor-specific considerations. By integrating macroeconomic factors, illiquidity preferences, and stochastic simulations, investors can better understand the complexities of private markets. Tailored commitment pacing, vintage diversification, and aligned liquid asset strategies are key to sustaining the desired exposure levels while managing liquidity risks, ultimately enhancing portfolio resilience and long-term performance.

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