

Beyond the Blind Pool

How private asset-backed structures reshape risk and return

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Abstract

Private markets have become a significant component of investor portfolios, offering the potential for enhanced risk-adjusted returns relative to public assets. However, structural features like illiquidity, irregular cash flows, information asymmetries, performance dispersion, and constrained access to private markets complicate portfolio construction and risk management practices. This paper examines the rise of private asset-linked structured products, particularly collateralized fund obligations (CFOs), as a mechanism for transforming portfolios of private assets into securities with distinct risk-return profiles. We analyze how these structures approach diversification, utilize tranching, alter cash flow timing, and address regulatory capital considerations; while also highlighting important limitations to these products. Drawing on academic literature, industry evidence, and quantitative analysis, we evaluate the role of CFOs within a broader portfolio context, showcasing potential benefits and structural complexities. The paper contributes a consolidated framework for assessing the investment implications of this emerging segment of structured finance.

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Executive summary

Private markets have grown substantially, becoming an essential allocation within institutional investor portfolios. Investments in private market strategies can offer compelling risk-adjusted returns relative to traditional public assets. However, features of the asset class like illiquidity, unpredictable cash flows, information asymmetries, and the wide dispersion in performance outcomes create challenges for investors seeking to build diversified private market investing programs.

There are many means available to investors for diversifying their private market allocations, including allocating to multiple managers across strategies, fund vintage years, focus sectors, and geographic preferences. Yet, while these allocation strategies help reduce idiosyncratic risk, diversification alone cannot eliminate exposure to macroeconomic conditions or overcome the fundamental features that characterize private market strategies.

Private asset-linked structured products, such as collateralized fund obligations (CFOs), have emerged in recent years as a potential solution to address some of these challenges. By transforming portfolios of private assets into securities with varying risk-return profiles, CFOs can inherently capture many elements of diversification, increase the speed of distributions back to investors, lower the amount of initial capital required to access private markets, and solve for regulatory challenges highly monitored groups like insurers face. These structures also facilitate risk transfer in a tailored way, allowing senior investors to benefit from stronger debt-like protections while offering junior tranches equity-like upside.

Although the opportunity that CFOs represent is compelling, they introduce structural complexities and rely on robust modeling, governance, and sponsor expertise. There are also relatively few examples of these structures active in the market, which presents challenges for would-be investors in understanding the potential benefits and tradeoffs of these structures.

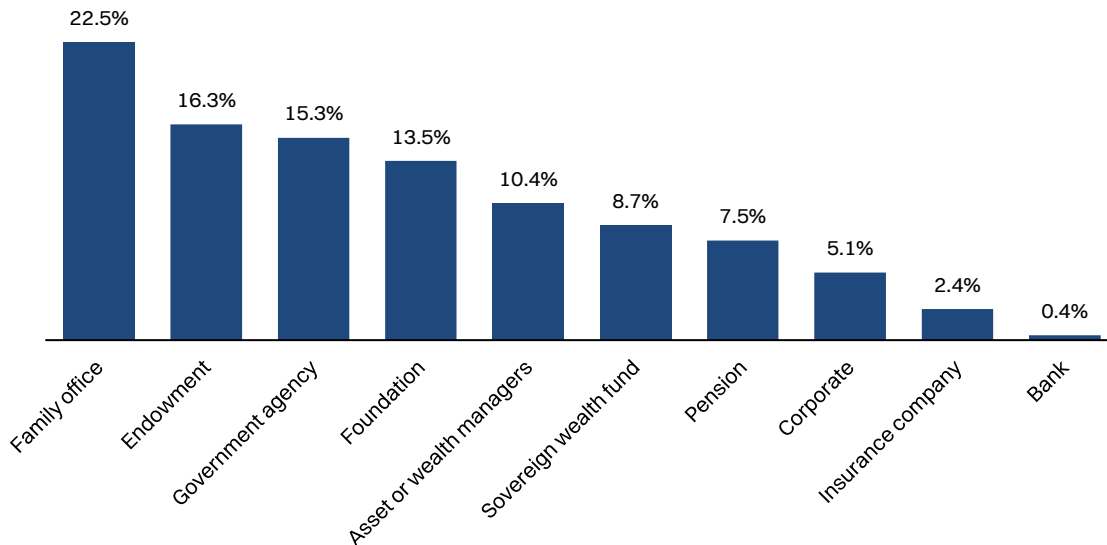
This whitepaper seeks to overcome many of these gaps in knowledge by consolidating findings from academic research, industry examples, and novel quantitative analysis. First is an initial discussion of the structural characteristics of private markets, risk and return profiles of different private market strategies, the relationship between public and private market returns, and quantitative approaches to diversified portfolio construction. These key concepts are then applied to private asset-linked structured products, highlighting how these products should be considered within the context of an overall investment portfolio. The aim of this whitepaper is to shed light on this niche, but rapidly growing, area of finance; and to distill key takeaways associated with the rise of private asset-linked structured products.



Introduction – The rise of private markets

Private markets have grown from a largely inaccessible corner of finance into a core pillar of institutional portfolios. Global private capital assets under management (AUM) has expanded considerably, from \$3 trillion in 2010 to nearly \$13.8 trillion by the end of 2024,ⁱ supported by strong fundraisingⁱⁱ and long-term performance.ⁱⁱⁱ “Traditional” private market strategies like private equity (PE) and venture capital (VC) are now represented heavily in the portfolios of family offices, endowments, foundations, and other institutional investors (**Figure 1**).

Figure 1: Median allocation to PE and / or VC as a percent of AUM by investor type^{iv}



However, multi-year capital lockups, limited liquidity, and sizable commitment minimums make it challenging for many newer and smaller investors to build diversified private market programs.

The secondaries industry has long represented one way to overcome these challenges, providing investors with diversified exposure to existing private assets and mitigating liquidity pressures. More recently, however, structured products backed by private assets have risen in prominence. These products reallocate risk and reward across private asset portfolios, and as they have matured have come to represent an evolution in private market portfolio construction and management. In these types of vehicles, investors purchase securities or equity shares linked to private assets, as opposed to committing directly to the funds themselves. Generally, these vehicles make payments to investors funded by cash flows from a diversified pool of underlying private assets, such as primary fund interests, secondary positions, or privately held companies. Structures vary in form, but generally provide more predictable cash flows and clearer risk and return profiles. Additionally, the transparency requirements for securitized offerings, including external oversight from trustees, rating agencies, and regulators, help mitigate some of the informational and structural challenges that accompany investing in traditional, closed-end limited partnerships.

One example of these structures is private asset-backed collateralized fund obligations (CFOs), a growing category within the broader private asset-linked structured products family. CFOs issue rated debt and equity tranches that allow investors to select their preferred risk-return exposure. As a result of the emergence of products like these, private-asset backed structured products have begun to attract a wider range of investors seeking private-market exposure.



Skepticism around these products, however, persists. Private markets remain fundamentally opaque, and structured products still carry residual stigmas stemming in large part from the mortgage-backed securities that fueled the Global Financial Crisis.^v Although post-crisis reforms have significantly strengthened underwriting standards, capital requirements, and investor protections,^{vi} significant questions remain over the potential risks and rewards associated with private asset-linked securitizations.

Against this backdrop, this paper takes a data-driven, first-principles approach to evaluating these structures. While many examples are presented through the lens of PE and focus on private-asset backed CFOs, insights apply broadly across private market strategies and structured products. We first outline the structural drivers of private market risk and return, and compare PE performance with public benchmarks. We then examine the role and limits of diversification in private asset portfolios before turning to the mechanics of private asset-linked structured products. Finally, we assess how securitization structures influence liquidity and risk-return profiles, and how these vehicles may fit within a broader institutional allocation framework.

Structural characteristics of risk and return in private equity

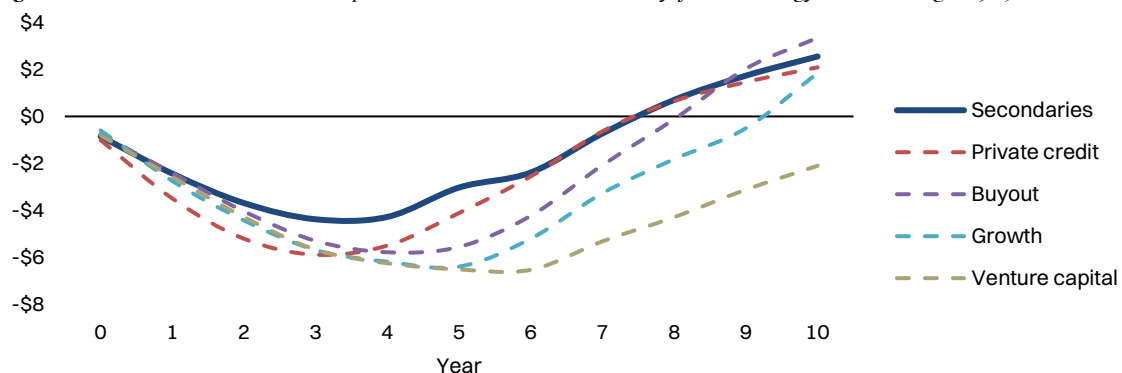
Private markets have a distinctive performance profile relative to other asset classes, driven by a number of unique characteristics. For limited partners (LPs), commitments to funds managed by general partners (GPs) can offer differentiated returns and portfolio diversification benefits. This section outlines the features that set PE's risk-return profile apart from public markets and inform the analyses that follow.

Illiquidity

A defining feature of PE is illiquidity. When LPs commit capital to a closed-end fund, they typically face a long horizon (about 14 years for buyout funds and 15 for VC funds) before capital and profits are fully returned.^{vii} Over this period, capital is effectively “locked up” in fund interests that are difficult to sell at a desired price and time.

GPs call capital gradually and return it as they realize investments, resulting in “lumpy” cash flows. This produces the familiar net distribution curve: negative early net cash flows driven by capital drawdowns into portfolio companies, alongside fees and expenses, followed by positive performance as value creation materializes over time, exits occur, and the fund distributes proceeds to investors. Although the depth and length of net distribution curves vary by strategy (for example, the median buyout fund turns profitable in year eight, while the median VC fund has yet to return capital after ten years) these patterns have been broadly consistent over time, as shown in **Figure 2** for funds formed between 1985 and 2014.

Figure 2: Median net distributions per \$10 million commitment by fund strategy (\$M, vintages 1985 – 2014)^{viii}





Notably, secondaries funds (those dedicated to purchasing existing LP stakes in both funds and PE-backed companies directly) have a shallower J-curve than all other PE strategies included in **Figure 2**: the negative portion is both milder and shorter-lived. While LPs can use secondaries to exit fund obligations early, LP sellers typically spend considerable time and effort arranging such transactions, and these transactions often occur at a discount to the asset's market value. As a result, research has found that secondary buyers often outperform sellers.^{ix}

The illiquidity premium in PE reflects the extra return investors demand for tying up capital in assets that cannot be freely traded.^x Estimates of this premium vary: Ang (2014) calculates roughly a 4%–6% premium for locking up capital for 5–10 years^{xi}, while Barclays, comparing annualized returns from liquid public benchmarks with return-like Preqin indices for 2007–2021, finds about 2%–4% for buyouts and 3%–5% for early-stage venture.^{xii} However, the magnitude of this premium is not guaranteed and may have declined over time.^{xiii} Because capturing it depends heavily on selecting managers that can generate returns well above liquid alternatives, the required compensation only reinforces the importance of creating diversified private market portfolios.

Availability and cost of debt

Another distinction between private and public market investing comes from the use of leverage, particularly in leveraged buyouts. PE investors often finance acquisitions of portfolio companies with a mix of equity and debt, using the portfolio company's cash flows as collateral. Leverage can amplify equity returns to investors, but it can also magnify losses if operating performance deteriorates or financing costs rise.^{xiv} Research suggests that buyout managers tend to use as much leverage as market conditions allow, so higher interest rates tend to slow capital deployment.^{xv}

Credit conditions also constrain exit opportunities, which can affect private capital funds beyond buyouts. Higher rates raise discount rates and make bonds more attractive, which can depress initial public offering (IPO) activity and M&A multiples, two primary exit routes for PE.^{xvi} Weaker exits, in turn, can slow new deal flow as GPs hesitate to invest without a clear path to realization.

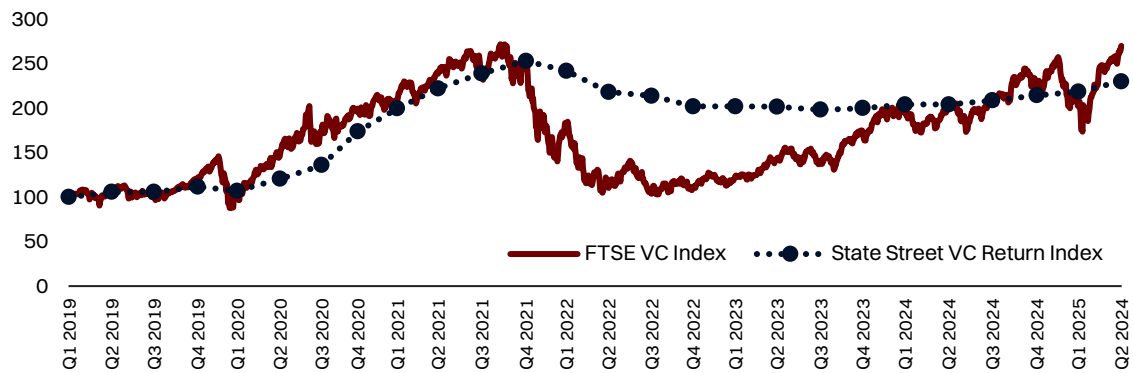
Disclosure and frequency of reporting

Relative to extensive disclosure and real-time pricing in public markets, private markets remain opaque: most funds do not provide contemporaneous reporting, disclosing performance information on a quarterly basis only; and reporting across managers lacks standardization. As a result, investors often have limited data for manager evaluation and benchmarking.^{xvii}

This is most evident in reported net asset values (NAVs), which are based on periodic appraisals and reported retroactively (that is, with a lag). Compared to marked-to-market daily prices among public equities, private funds' NAVs face “stale pricing,” a process resulting in valuations that adjust slowly.^{xviii} As a result, when calculating time series of private market returns, volatility appears artificially lower and return series appear smoothed, making comparisons against liquid assets difficult.^{xix} For example, during the 2022 venture downturn, public-market proxies such as the FTSE Venture Capital Index repriced sharply as financial conditions tightened, while quarterly private market indices like the State Street VC Return Index took nearly two years to converge to public valuations (**Figure 3**). This stale pricing complicates comparisons of public and private returns, as discussed later in this section.



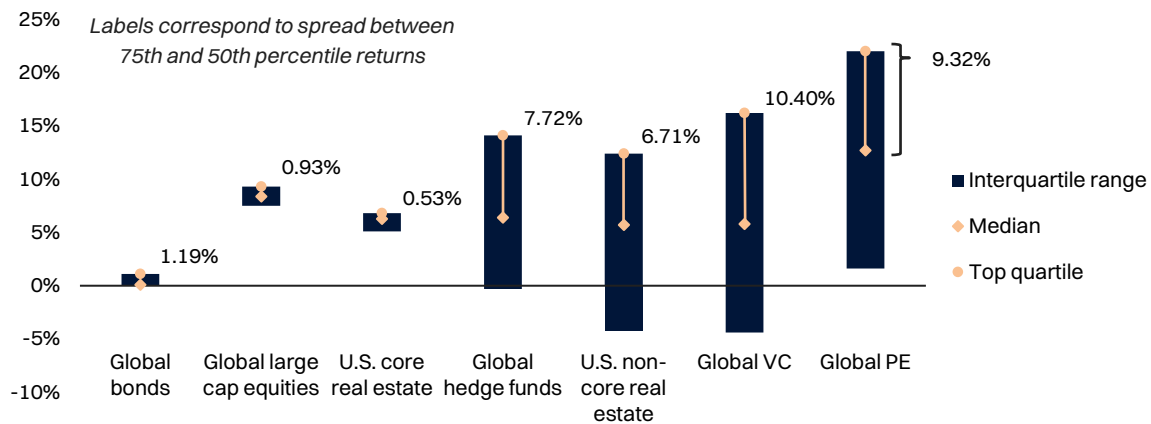
Figure 3: State Street VC Return Index versus FTSE Venture Capital Index (rebased to Q1 2019 = 100) ^{xx}



Fund manager selection

Fund manager selection is one area where informational gaps in private markets are especially consequential. Empirical research indicates that manager choice is critical for outperformance in private markets, given the much higher dispersion of returns among PE funds relative to other asset classes. **Figure 4** illustrates that for 10-year returns of global PE over the period ending 31 December 2024, the dispersion between the top-quartile and median fund manager was 9.32% per annum, far greater than for mutual funds and ETFs (Global Large Cap Equities, 0.93%) or bonds (Global Bonds, 1.19%).

Figure 4: Private and public manager dispersion (top versus bottom quartile returns), Dec. 2014 – Dec. 2024 ^{xxi}



This wide dispersion among private market funds is especially problematic given the decline in performance persistence, or the ability of a GP to replicate past outperformance. This is particularly evident for buyout managers, of whom only 24% have repeated top-quartile performance in vintages after 2001, compared with almost 37% before 2001. ^{xxii} In other words, even when backing managers with strong track records, LPs face considerable uncertainty over whether a given fund will ultimately end up near the top or bottom of the return distribution.

Taken together, these differences between private and public assets can complicate analysis and portfolio construction, but also help explain the private assets' historical return premium. The next section considers how to account for these effects when measuring PE fund performance, especially relative to public markets.



Understanding private equity returns against public markets

Given the unique characteristics of PE discussed above, investors must be careful when analyzing these assets' financial performance. While illiquidity and other features can complicate the assessment of returns, the maturation of PE as an asset class has led to established best practices for evaluating performance.

In practice, PE funds are usually compared using two metrics, Internal Rate of Return (IRR) and Total-Value-to-Paid-In (TVPI, sometimes referred to as Multiple-of-Invested-Capital, or MoIC), each capturing different aspects of returns, as outlined in **Table 1**.

Table 1: Comparison of IRR and TVPI

Metric	What it measures	Advantages	Limitations
IRR	Discount rate that sets the net present value of all cash flows to zero, reflecting the time-weighted return on contributed capital.	✓ Accounts for timing of cash flows ✓ Intuitive measure of how efficiently capital was deployed	! Places disproportionate weights on early distributions ! Assumes reinvestment at the IRR ! Sensitive to fund pacing and interim IRRs calculated using periodic NAVs
TVPI / MOIC	Total value created relative to capital paid in, irrespective of timing.	✓ Simple, time-neutral measure of wealth creation ✓ Avoid reinvestment assumptions	! Ignores timing of cash flows ! May give misleading impressions about the pace at which returns are generated

Given each metric's limitations, investors typically use them together, helping to offset the shortcomings of either used in isolation. **Figure 5** reports IRR and TVPI received by LPs net of fees, based on performance calculated over the pooled cash flows of all PE funds launched in that year. Calculating a single pooled return across all PE funds from vintages 1990 to 2021 yields an IRR of 13.4% and a TVPI of 1.77 (i.e., \$1.77 for every \$1 invested).^{xxiii}

Figure 5: Net pooled IRR and TVPI of PE funds by vintage, 1990 – 2021^{xxiv}

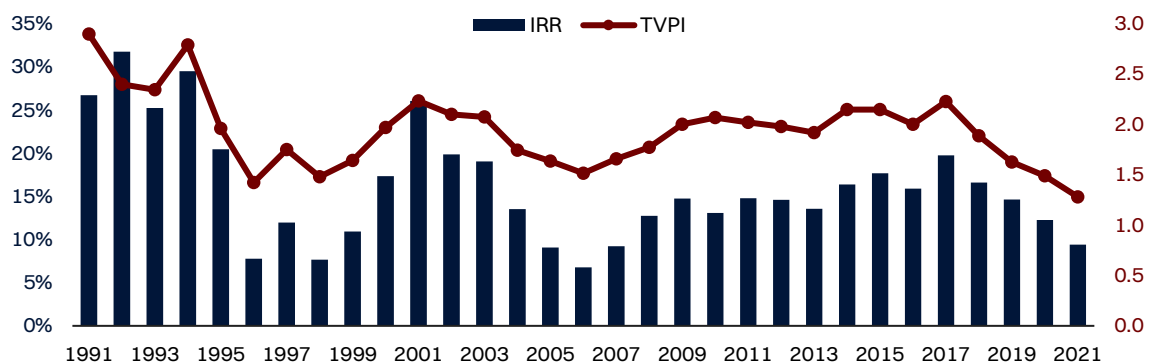


Figure 5 also illustrates the cyclical nature of PE returns. During periods when funds generate strong performance, LPs often increase commitments, driving up deal prices as “too much money chases too few deals,” which in turn compresses returns.^{xxv} This underperformance often becomes apparent during a public



market downturn. In the aftermath, investors scale back commitments, the macroeconomy recovers, and returns improve with lower valuations, restarting the cycle. Consistent with this pattern, the graph shows that vintages raised before the dot-com bust (1996 – 1999) and before the global financial crisis (2005 – 2007) have generally underperformed other vintage years.

Although IRR and TVPI are useful for comparing PE funds with their private market peers, they are less informative for benchmarking performance against public equities. IRR is a money-weighted metric, whereas most public asset class returns are time-weighted. Time-weighted returns do not capture the impact of uneven, unpredictable cash flows and thus fail to reflect the actual rate of return realized by private market LPs.^{xxvi}

Traditional asset-pricing models, most notably the Capital Asset Pricing Model (CAPM) and extensions like the Fama-French framework, also pose difficulties when assessing private returns against public returns. These models relate expected returns to market risk (measured through beta) and other factors (like those in the Fama-French three- and five-factor models) and interpret deviations from those returns as alpha.^{xxvii} While this logic works well for liquid, frequently priced public securities, the assumptions underpinning CAPM do not hold in private markets. Quarterly valuations, stale prices, and appraisal-based reporting suppress volatility and distort correlations with public benchmarks. As a result, CAPM models applied to PE typically understate beta and overstate alpha.^{xxviii}

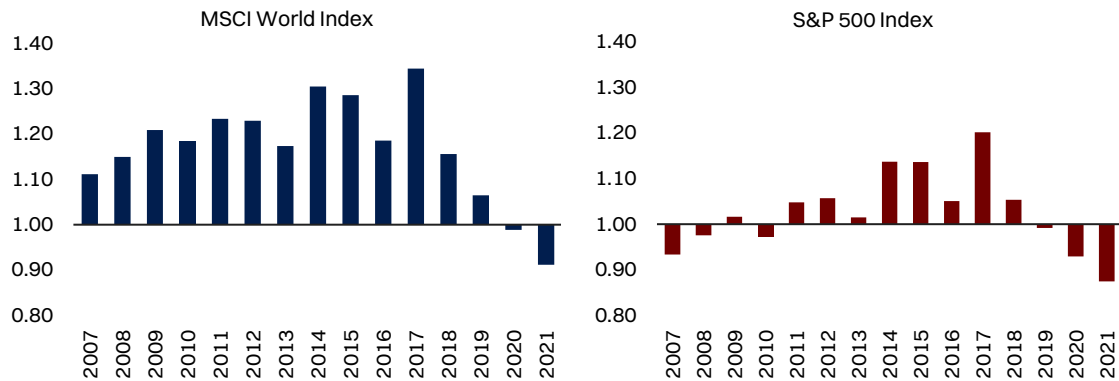
Academics have attempted to address these issues using different private market data sources, public market indices, and calculation methodologies to estimate betas in PE. Korteweg (2018) documents substantial variation across studies, with estimated fund-level buyout betas ranging from 1.0 to 1.5 and venture betas from 1.5 to above 2.0.^{xxix} Korteweg and Nagel (2024) expand on prior research and estimate betas ranging from 0.8 to 1.3 for buyouts and 1.7 to 2.6 for venture capital. These differing estimates indicate that even with updated data and methodologies, applying public market approaches to private assets poses significant challenges with outputs incredibly sensitive to inputs.

To address the limitations of private market measures like TVPI and IRR, as well as the difficulties of applying CAPM-style metrics to private assets, investors often rely instead on the public market equivalent (PME) to compare private returns with public markets.^{xxx} This metric represents the return an investor would have earned by investing in a public market index instead of a PE fund, using cash flows that are identical in size and timing to those of the fund. The Kaplan-Schoar (KS) PME, a commonly used public market benchmark, is calculated as the ratio of the present value (PV) of distributions divided by the PV of contributions, with discount factors obtained from the returns of a public market index. When this ratio exceeds 1, the KS-PME indicates that a private investment has outperformed the public index to which it is compared.

Figure 6 illustrates KS-PMEs for PE funds across fifteen vintage years through 2021, relative to two public equity indices. Except for the 2020 and 2021 vintages, whose funds may not have had sufficient time to realize returns, PME relative to the MSCI World Index are greater than one, indicating that PE funds have consistently outperformed. The average KS-PME of 1.17 across these vintages indicates that, from 2007 through Q2 2025, PE funds exceeded the MSCI World by 17%. Although the degree of outperformance is lower when benchmarked against the S&P 500 Index, PE funds still deliver higher returns in nine of the fifteen vintages, with an average PME of 1.03, above one and indicating superior results relative to public markets.



Figure 6: Kaplan-Schoar PME for PE funds, vintages 2007 – 2021 ^{xxxi}



Altogether, these results indicate that the performance of private markets has exceeded that of public markets, after accounting for differences in cash flow timing and benchmarking methodology. However, the dispersion of returns across funds, strategies, and vintage years remain substantial, making portfolio construction a critical determinant of investor outcomes. The next section examines how diversification across key dimensions (such as portfolio size, strategy, vintage, and geography) can help mitigate this dispersion and shape the risk and return characteristics of private capital portfolios.

Diversification in private market portfolios

Diversification in private capital portfolios aims to reduce idiosyncratic risk by combining funds with different characteristics, such as strategy, geographic focus, target sectors for investment, and fund vintage. As discussed earlier, because performance in private markets is highly dispersed, spreading commitments across multiple dimensions helps investors avoid concentration in any single underperforming fund or market segment.

To quantify how different forms of diversification affect portfolio outcomes, we simulate a large set of private capital portfolios using historical fund-level cash flows from Preqin and the modeling framework introduced in Beutler et al. (2023) to generate probabilistic ranges of portfolio cash flow and performance outcomes, based on actual, historical outcomes. ^{xxxi} The analysis explores variations in key portfolio characteristics, such as the number of funds in a portfolio, the mix of strategies included, and the range of fund vintage years, and then measures how these choices influence overall return outcomes. For each combination of characteristics, thousands of portfolios are simulated to see how portfolios with various characteristics would have performed over a 10-year investment horizon.

Diversification by number of funds

A foundational question is how many fund commitments are required to achieve a meaningfully diversified private capital program. Intuition and prior research suggest that adding more funds to a portfolio reduces idiosyncratic risk, or the risk that any single poorly performing fund materially depresses overall portfolio outcomes. Simulation results confirm this assumption: portfolio-level return dispersion declines as the number of underlying funds increases.

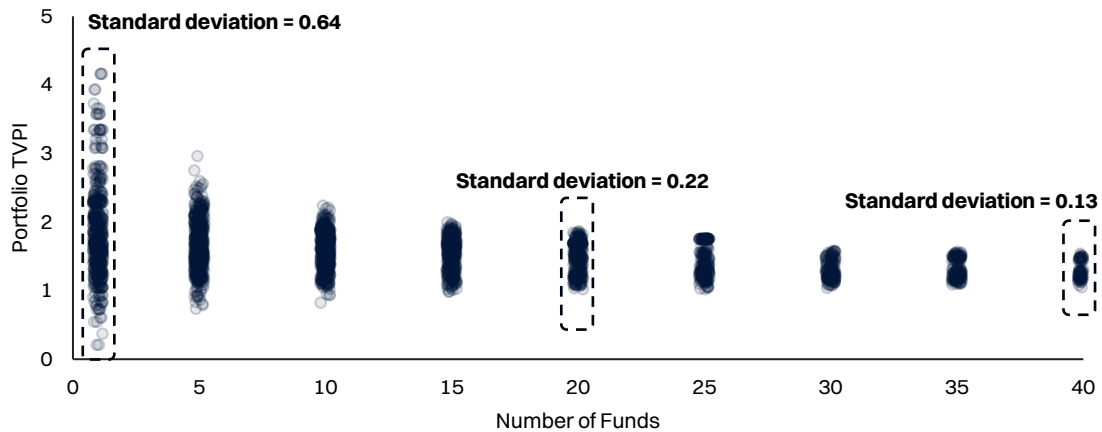
To isolate the effect of portfolio size from other drivers of diversification such as vintage or strategy mix, the analysis focuses on portfolios composed exclusively of new buyout fund commitments (that is, buyout funds without any performance history, akin to an investor making commitments in a newly announced fund). The analysis considers portfolios ranging in size from a single fund commitment (highly concentrated) to 40 fund



commitments (highly diversified). As shown in **Figure 7**, the standard deviation in portfolio TVPIs calculated at the end of the 10-year horizon falls sharply when moving from one to five funds, and continues to decline, albeit at a slower rate, as the number of funds increases. Beyond 30 funds, the compression of performance outcomes becomes modest, and the incremental diversification benefit per additional fund tapers.

Figure 7: How portfolio size impacts simulated portfolio TVPIs calculated at year 10

Each blue dot represents a single simulated portfolio TVPI



Diversification by fund strategy

Different private market fund strategies exhibit distinct return drivers, risk profiles, and sensitivities to macroeconomic conditions. As a result, mixing strategies within a private market program provides a meaningful source of diversification beyond simply adding more funds or spreading commitments across vintages or geographies. Academic evidence shows that strategy-level factors account for a significant share of performance dispersion across private market portfolios, reinforcing the idea that combining strategies can smooth overall return patterns.^{xxxiii}

To quantify the relationships among common private market strategies, as well as between private markets and traditional public assets, we examine the pairwise correlations of quarterly returns for buyout funds, venture capital funds, private credit funds, the S&P 500 Total Return Index, FTSE World Broad Investment-Grade Bond Total Return Index, and the ICE BofA Global High Yield Index over the 2007 - 2024 period. To address the smoothing effects embedded in appraisal-based private market valuations, we apply a standard first-order autoregressive (AR(1)) de-smoothing adjustment to the quarterly return series of the private-market strategies.^{xxxiv} The resulting correlation matrix (**Table 2**) illustrates how these strategies co-move with one another and with traditional public markets.



Table 2: Pairwise correlations among selected private market strategies, the S&P 500, investment-grade (“IG”) bonds, and high-yield (“HY”) bonds, 2007 – 2024^{xxxv}

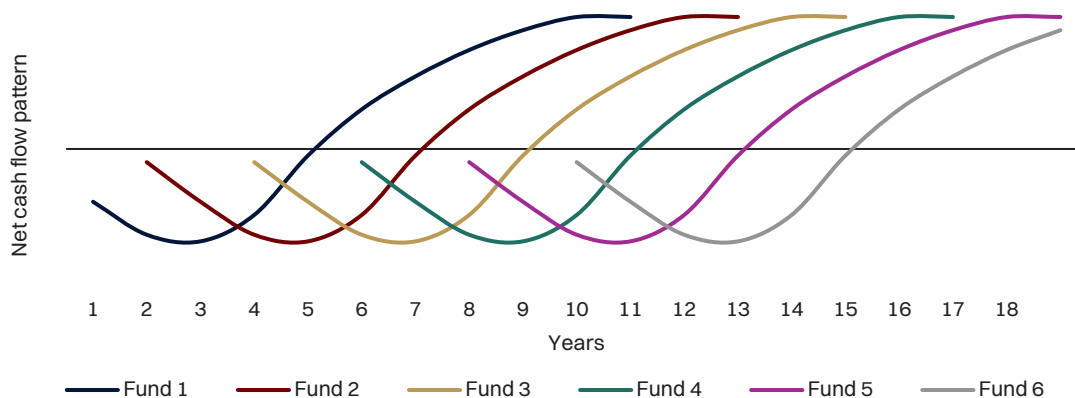
	Buyout	Venture capital	Private credit	S&P 500	IG bond	HY bond
Buyout	1.00					
Venture capital	0.73	1.00				
Private credit	0.93	0.61	1.00			
S&P 500	0.82	0.64	0.81	1.00		
IG bond	0.15	0.12	0.09	0.21	1.00	
HY bond	0.81	0.55	0.90	0.80	0.30	1.00

Overall, private market strategies are imperfectly correlated with one another and with traditional assets, and these empirical patterns carry through when the analysis shifts from a stand-alone return series to a portfolio setting. A growing body of research directly models the impact of introducing private funds into traditional stock-bond portfolios. For example, using a sample of 3,380 U.S. buyout, VC, and real estate funds, Brown et al. (2021) show that adding private funds to a portfolio consisting otherwise of public equity raises average portfolio returns; and, for buyout and real estate funds, reliably improves Sharpe ratios even after accounting for fees, commitment pacing, and implementation frictions.^{xxxvi} Along with the correlations in **Table 2**, these findings suggest that well-diversified allocations to private strategies can enhance the efficiency of traditional stock-bond portfolios for long-horizon investors.

Diversification by vintage year

Vintage year diversification is a core aspect of private market portfolio construction. Incorporating multiple vintage years helps mitigate cash flow volatility, as the “J-curves” of different funds offset one another over time. As illustrated in **Figure 8**, negative cash flows from a recently launched fund can coincide with positive distributions from an older fund, thereby smoothing overall portfolio liquidity.

Figure 8: Illustrative example of fund-level net cash flows



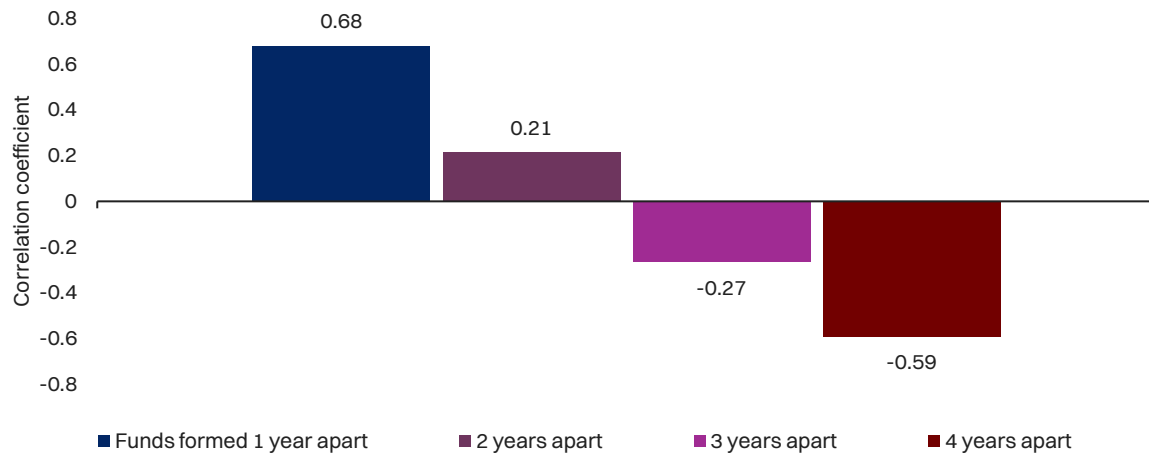
Additionally, because PE funds are exposed to the prevailing economic and credit conditions at the time capital is deployed, vintage years tend to behave like macroeconomic “cohorts:” they capture the market environments, deal pricing, exit conditions, and leverage availability that all funds formed in those years



share. Indeed, academic research shows that PE returns cluster by vintage year, reflecting common macro drivers and fundraising cycles rather than GP-specific characteristics alone.^{xxxvii}

This can be seen explicitly in **Figure 9** below, where correlations in performance outcomes (measured using since-inception IRRs calculated as of Q2 2025) are higher for funds formed in adjacent vintages, but fall quickly as the vintage gap widens. Correlations even become negative for funds formed three years apart (-0.27) and decline to -0.59 for funds formed four years apart. The negative correlations over longer vintage gaps may reflect the cyclical nature in returns observed in **Figure 5**: years with unusually strong (weak) outcomes tend to be followed, a few years later, by vintages with weaker (stronger) returns. As a result, there are diversification benefits to be realized by including funds of different vintage years in a single portfolio.

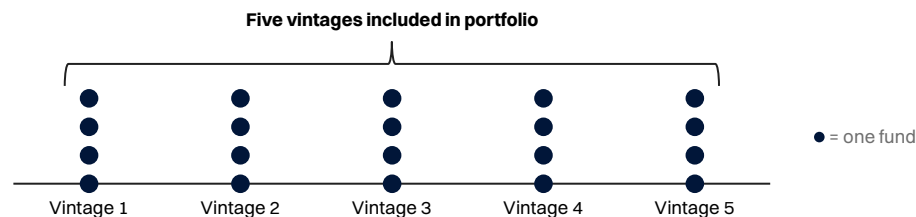
Figure 9: Correlations in pooled IRR by vintage “gap,” using buyout funds formed between 1998 - 2020^{xxxviii}



Simulations also reveal the effect of introducing additional vintage years to a portfolio. In the analysis below, thousands of portfolios containing 20 buyout funds are simulated, but the vintage *spread* (that is, the number of consecutive buyout fund vintages included in the portfolio) varies from 1 to 10 years. For example, a one-year spread concentrates exposure in two adjacent vintage years, whereas a ten-year spread distributes the same 20 funds evenly across eleven consecutive vintages (see **Figure 10** below, which illustrates this concept for a portfolio including 5 total vintages). All portfolios are evaluated over a standardized 10-year investment horizon.

Figure 10: Example of vintage-spread construction for a simulated portfolio

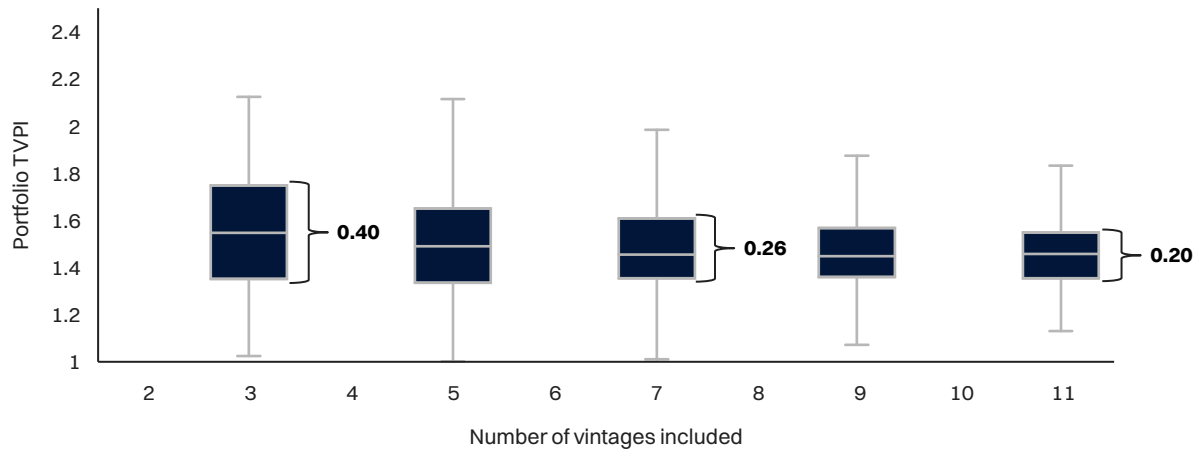
The blue circles represent the distribution of 20 PE Funds by vintage year in a simulated portfolio



The results show a clear pattern. Portfolios with a wider range of vintage years exhibit a lower dispersion in performance outcomes, reducing portfolio-level risk (**Figure 11**). Although the marginal benefits to vintage year diversification taper as the range of vintage years widens, the overall pattern confirms that vintage diversification meaningfully stabilizes performance outcomes relative to portfolios concentrated in only a handful of vintages.



Figure 11: How vintage spread impacts the standard deviation of portfolio TVPI



Taken together, the correlation analysis and simulation results indicate that vintage year diversification is an effective mechanism for reducing private market portfolio volatility. By spreading commitments across multiple market cycles, investors can better mitigate exposure to specific macro conditions, while enhancing the stability and resilience of long-term portfolio outcomes.

Diversification by sector focus

PE managers frequently specialize in particular industries like healthcare, technology, or retail where domain-specific expertise may enhance their abilities to create value. Research from both academia and industry indicates that sector-specialized private equity firms tend to outperform compared to generalist firms.^{xxxix xl} At the same time, this also increases investors' exposure to sector-specific shocks and concentration risks. Diversifying commitments across managers who target different sectors may therefore enable investors to optimize risk and return tradeoffs.

This can be assessed by considering since-inception PE return data for buyout and VC funds (formed between 1998 and 2022) and segmented by sector. For each pair of sectors, correlations are once again calculated (**Table 3**).

Table 3: Pairwise correlations of sector-segmented fund returns (TVPI), vintages 1998 - 2022^{xli}

	Technology	Consumer / Retail	Multi Industry	Health Care
Technology	1.00			
Consumer / Retail	0.27	1.00		
Multi Industry	0.31	-0.05	1.00	
Health Care	0.63	-0.20	0.46	1.00

This correlation analysis demonstrates that allocating to managers with exposure to different economic sectors can offer meaningful diversification benefits within private markets. Even sectors with positive correlations can provide diversification benefits, since risk will be lower compared to focusing investments within a single industry (such as technology). These results are largely in line with research on correlations between public market sectors which finds positive but imperfect correlations between different market sectors.^{xlii} Overall, sectoral heterogeneity supports the view that PE performance is influenced by many



economic drivers, and that seeking exposure to managers focusing on different sectors can be an effective mechanism for reducing portfolio volatility over long horizons.

Diversification by geography

Geographic diversification offers meaningful protection against localized economic or market shocks. Because cross-regional private market returns are imperfectly correlated due to differences in economic cycles, regulatory environments, and competitive dynamics, portfolios diversified across multiple regions are expected to experience lower volatility than those concentrated in a single region. **Table 4** shows the correlations between since-inception PE return data for buyout and VC funds (formed between 1998 and 2022) in different regions. The relatively low correlations among regions highlight the diversification benefits available to global investors.

Historical market dislocations further support this pattern. For example, the 2011 European sovereign debt crisis, which sharply impacted equity and credit markets across the Eurozone, did not produce equally severe drawdowns in North American or Asian markets.^{xliii} Likewise, the 2015 – 2016 Chinese equity market downturn triggered by rapid deleveraging and government intervention was largely contained within Asia and had more muted spillover effects into the U.S. and European markets.^{xliv}

Table 4: Pairwise correlations of region-segmented fund returns (IRR), vintages 1998 - 2022 ^{xlv}

	Emerging	United States	Europe developed	Other developed
Emerging	1.00			
United States	0.06	1.00		
Europe developed	0.38	0.05	1.00	
Other developed	0.11	0.13	0.64	1.00

Geographic diversification can also help mitigate currency risk. Allocating capital across regions and currencies helps hedge against sharp moves in any single currency, such as the 11% decline in the U.S. dollar during the first half of 2025, which could otherwise erode portfolio value.^{xlvi}

As a result, diversifying commitments across multiple geographies helps reduce idiosyncratic regional risk while broadening exposures to different growth drivers, market structures, and macroeconomic environments.

Secondaries as a means of achieving diversification

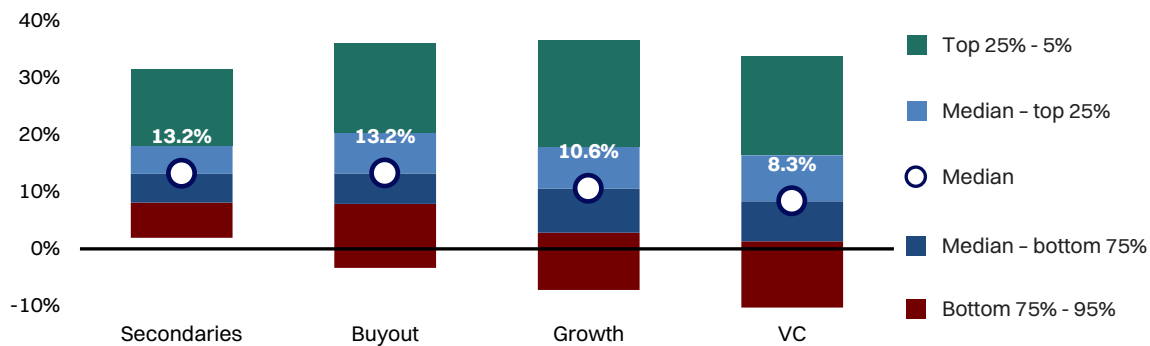
Through the private capital secondary market, investors can diversify their PE exposure. This market has grown rapidly, with global secondary transaction volume reaching \$162 billion in 2024 and surpassing the previous record of \$132 billion in 2021.^{xlvii} Because secondary interests are typically acquired in funds or assets that are already partially invested or realized, buyers often have greater visibility into underlying companies and cash flow projections, thus reducing “blind-pool” risk common to primary fund commitments.

Secondaries can also improve the overall risk-return profile of a PE allocation through shallower and shorter J-curves and diversification across managers, vintages, sectors, and geographies. Dedicated secondary funds, which assemble portfolios from many underlying funds and assets, provide an efficient way to obtain diversified exposure in a single vehicle, reducing the concentration risk that can arise from a small number of primary commitments.



Secondary funds can also reduce the operational overhead typically required for diversifying and expanding a PE program by limiting the diligence, monitoring, and reporting burdens associated with maintaining a larger set of primary fund relationships. Because secondary managers underwrite portfolios with known assets and cash flow histories, they can also be more selective in targeting high quality funds or transacting at favorable pricing during periods of market dislocation. This contributes to a more favorable risk profile compared to other private market strategies (**Figure 12**). Notably, even lower-performing secondary funds have historically generated positive returns, highlighting the benefits of this structure.

Figure 12: Net IRR dispersion by fund strategy, vintages 2001 - 2022^{xlvi}



The limits of diversification in private markets

While diversification can reduce expected risk and increase expected returns on average, there are limits to its efficacy. Several structural features of PE and other private market asset classes limit how far diversification can improve outcomes; and, in some cases, excessive diversification can even dilute returns.

First, diversification cannot eliminate systematic or macroeconomic risk entirely.^{xliv} Private markets remain exposed to broad economic forces such as interest rate cycles, credit availability, and exit market conditions. Periods of elevated rates, constrained lending, or weak IPO markets can depress valuations and distributions across most private capital asset classes simultaneously. Even portfolios holding dozens of funds across regions, vintages, and sectors often experience correlated drawdowns during global downturns.ⁱ For example, during the Global Financial Crisis, distributions across all private market strategies fell to less than 2% of what their respective NAVs were at the start of the quarter.ⁱⁱ Diversification mitigates idiosyncratic manager or deal risk, but systematic private market risk remains undiversifiable.

Second, diversification has diminishing marginal benefits and real costs. From above, simulations show that the diversification benefits from increasing the number of funds in a portfolio are largely achieved when there are approximately 25 funds in a portfolio. Beyond 25 funds, further additions offer limited incremental benefits, all else equal. This is particularly important when considering that each new GP relationship introduces fees and oversight costs. Research by Metrick and Yasuda estimates that VC funds charge, on average, \$7.9 million in management fees per partner per fund, and buyout funds charge roughly \$10.1 million per partner, per fund.ⁱⁱⁱ Despite some fee concessions that come with making larger or repeat commitments, these are fixed costs that generally grow as an LP adds more GP relationships. Beyond headline management fees, LPs also absorb a growing set of partnership expenses that are not included in the management fee. According to ILPA's Private Markets Fund Terms Survey, a majority of LPs reported bearing additional charges for regulatory filings, advisor and affiliate salaries, in-house legal staff, and internal fund administration.ⁱⁱⁱⁱ These costs accumulate as the number of fund commitments increases, even when incremental diversification benefits do not.



Third, the “alpha” in private markets may come in part from making concentrated bets. Given information asymmetries among investors, fund managers, and market observers, private markets are less efficient than public markets. This creates room for investors to generate excess returns through targeted allocations, rather than broadly diversified “market” portfolios. For example, some investors may concentrate commitments in managers focused on artificial intelligence or growth-stage technologies, while others may avoid those areas entirely, believing valuations are stretched. As a result, broad diversification strategies that have proven to outperform active management in public markets^{liv} may not lend themselves as effectively to private markets, limiting the power of diversification in private markets.

Fourth, the structural features of PE funds impose liquidity and pacing constraints. LPs may aspire to pursue granular, dynamic diversification by selectively investing in and regularly rebalancing across strategies, geographies, or vintages. However, this approach is difficult in practice. GPs raise capital intermittently over drawn-out fundraising periods, and LPs may lose access to top-tier GPs if they cherry-pick funds in which to invest. In addition, LPs can choose only when to *commit*, not when capital is put to work by GPs. Consistent with these frictions, Brown et al. (2020) finds that attempts to time capital deployments have minimal impact on LP returns at best.^{lv} Rebalancing through secondary sales is also costly: research indicates buy-and-hold investors outperform those who exit a fund interest early, in part due to secondary market discounts.^{lvi} Together, these frictions suggest that private markets reward a long-term perspective, and that aggressive short-horizon market-timing or frequent tactical reallocations can be self-defeating for returns. **Table 5** summarizes these four diversification limits.

Table 5: Summary of diversification limits

Systematic risk	Diminishing benefits	Concentration trade-offs	Practical constraints
Diversification cannot eliminate systematic risk. Private markets remain exposed to broader macro trends.	Risk reduction may be small compared to the additional complexity and financial costs of managing a larger portfolio.	A strong focus on diversification may reduce exposure to high-conviction opportunities.	LPs may lack the capital, liquidity, or access needed to build and maintain a sufficiently diversified portfolio.

These practical constraints highlight an important reality: while diversification is theoretically desirable, achieving deep, multi-dimensional diversification in private markets can be operationally burdensome and capital-intensive. These frictions have motivated the rise of private asset-linked structured products that have diversification built into the offerings directly, allowing investors to easily achieve diversification through a single vehicle, rather than through numerous individual fund commitments.

Introduction to structured products

Structured financial products have long been an integral part of global capital markets. Often, these instruments use securitization: the process of pooling income-producing assets and transforming them into tradable securities with differentiated risk and return profiles. The underlying assets (for example, loans, receivables, or fund interests, to name a few) generate cash flows, which are then used to service interest and principal payments to investors holding the issued securities (in the case of debt-like securities), or to fund dividend payments and redemptions of shares (in the case of equity-like securities).

There is a long history of asset-backed securities (ABS) in public markets, with mortgage-backed securities (MBS) being one of the better known examples of this type of structured product. Over time, the securitization



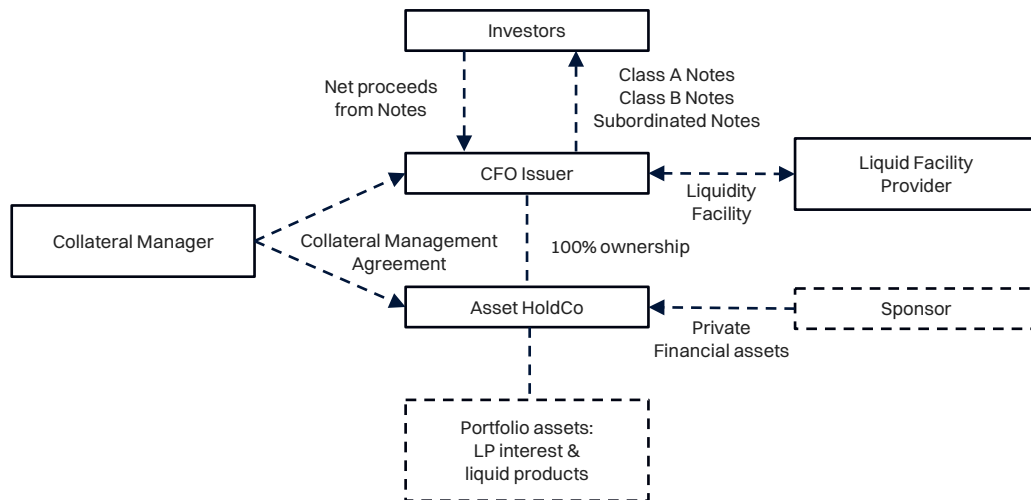
model has evolved beyond traditional consumer or corporate credit into private markets, enabling investors to access cash flows from typically illiquid holdings such as PE and private credit funds.

A fast-growing development within this space is the collateralized fund obligation (CFO), which is a structure that securitizes LP interests in PE or other private market funds. Functionally, a CFO resembles an ABS: a pool of fund interests is placed into a special purpose vehicle (SPV), which consists of a series of tranches (or classes) of notes with different levels of expected risk and return, stemming from their seniority in the offering's repayment "waterfall." These classes often include senior debt securities, subordinated or mezzanine notes, and equity shares.

In practice, the CFO issuer may obtain its portfolio of private assets either by purchasing them directly with proceeds from note issuances, or by first acquiring them from another investor seeking to generate liquidity from existing holdings and subsequently securitizing the portfolio. These interests are typically held in a separate subsidiary, often called an "Asset HoldCo," which owns the portfolio on behalf of the CFO structure. Using an Asset HoldCo helps isolate the assets, simplifies administration, and ensures the structure complies with common restrictions in private-fund agreements regarding transfers or collateralization.

A collateral manager often oversees the portfolio of fund interests and related cash flows. The CFO structure may also include a liquidity facility provider that offers short-term funding to bridge timing mismatches between cash flows in and out of the CFO's underlying interests. **Figure 13** illustrates the key relationships among these entities in a typical CFO transaction.

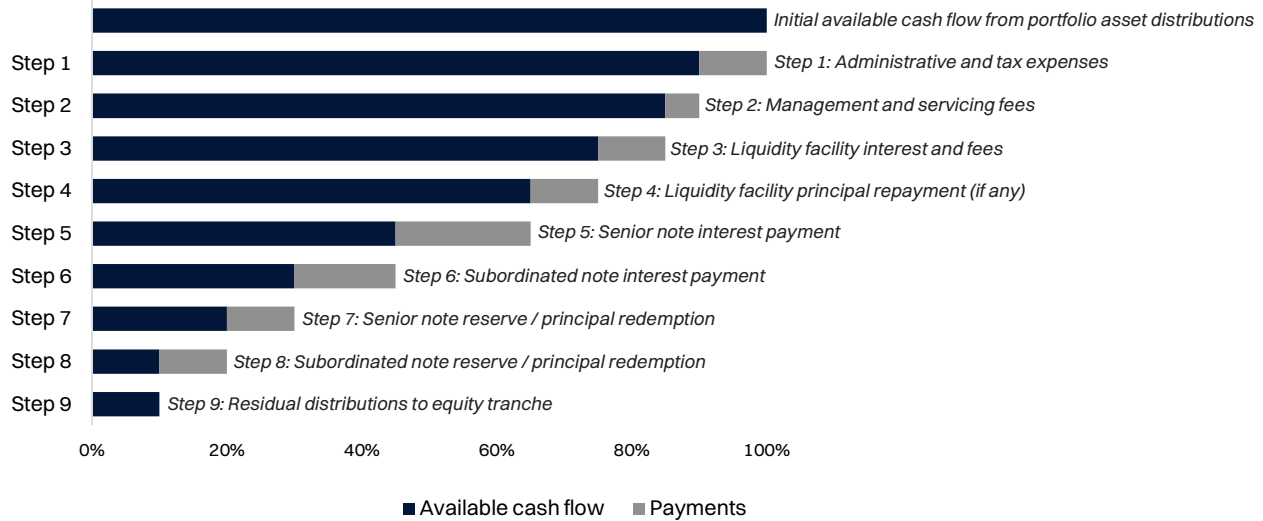
Figure 13: Illustrative CFO transaction^{lvii}



Once established, the CFO structure channels cash flows from the underlying assets through a defined sequence of payments, typically known as the transaction waterfall (**Figure 14**). Senior notes are paid first, followed by mezzanine notes, with any remaining cash flowing to the equity tranche. Losses, if they occur, are absorbed in the reverse order. To align with the longer investment horizons associated with private market assets, CFOs are structured with extended maturities (typically 15 years or more) allowing the vehicle to accommodate variations in portfolio distributions, and to ensure eventual repayments to senior noteholders.



Figure 14: Illustrative CFO transaction waterfall



Benefits of securitization

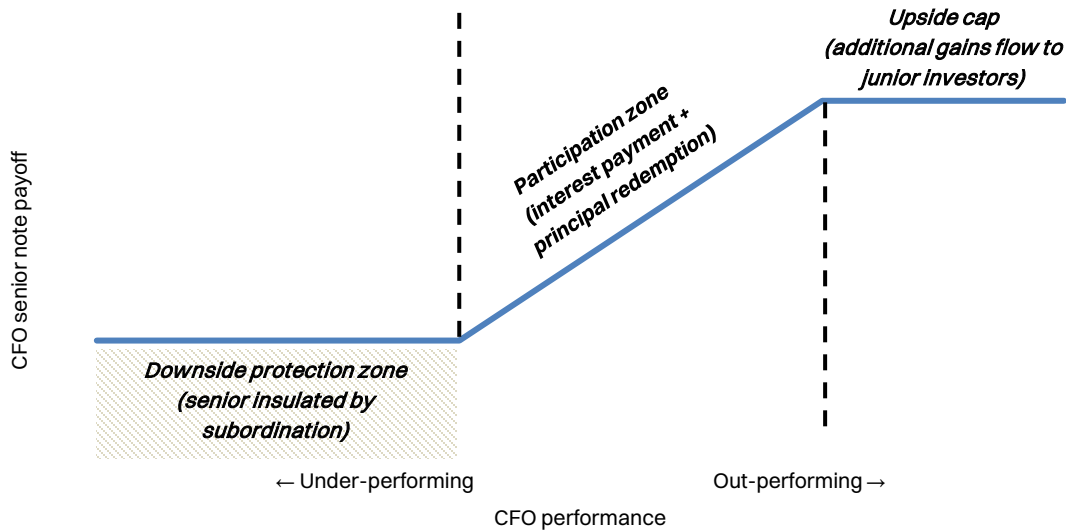
Structured products repackage portfolios of private asset interests into instruments with risk, return, and liquidity characteristics that can be tailored to different investor mandates. This section highlights key benefits of these structures.

Tranche-based risk transfer

A major advantage of securitization is the ability to redistribute risk across investors with different objectives, an option not available through traditional fund commitments. In a CFO structure, senior note holders receive a more stable stream of coupon payments supported by credit enhancement and structural protections. As illustrated in **Figure 15**, their payoff profile is characterized by limited downside, capped upside, and a predictable return path: losses are absorbed first by junior tranches, and senior investors do not participate in the upside once their principal and coupons have been paid.

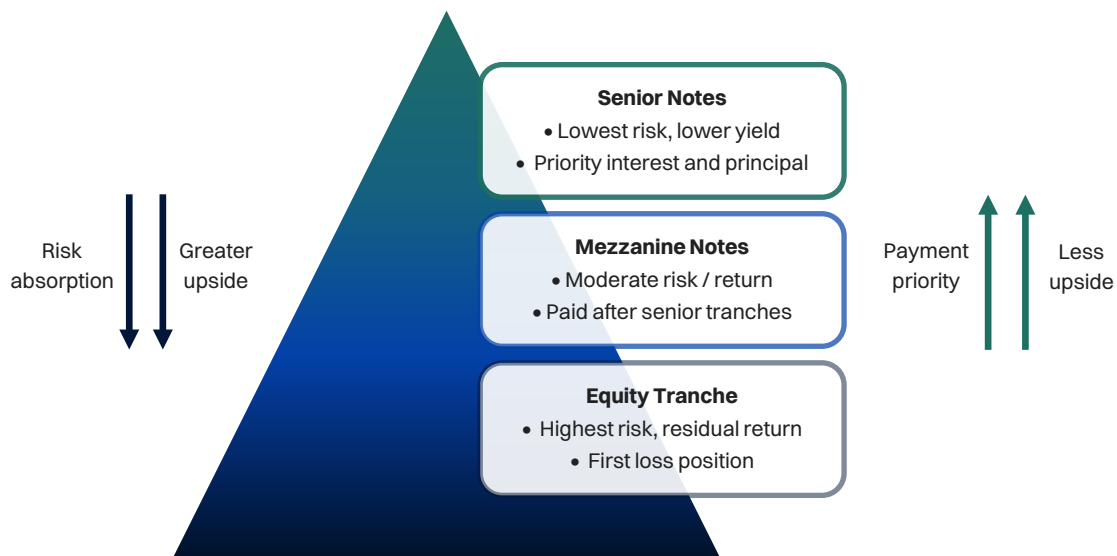


Figure 15: Illustrative example of CFO senior note payoff



Subordinated noteholders and equity investors sit lower in the capital stack and therefore assume greater exposure to the performance of the underlying funds. Their payoff profiles are correspondingly steeper: they bear losses once senior protections are exhausted, but they also retain the full upside after senior and mezzanine obligations are satisfied, as illustrated in **Figure 16**.

Figure 16: Risk-return diagram of distinct tranches in a CFO



Through this tranche-based structure, a CFO transforms the undifferentiated risk that a single LP would normally bear into a suite of instruments tailored to different institutional mandates, ranging from investment-grade income to higher-return, higher-volatility equity exposure. This broadens the potential investor base and creates more flexible financing options for private market portfolios.

Lower cost of capital



A related benefit of this tranche-based structure is that CFOs can materially reduce the weighted average cost of capital (WACC) for a given portfolio of private asset interests, relative to obtaining the same exposure through traditional means. From above, investors typically expect a premium for investing in private markets (for example, to compensate for illiquidity). However, in a securitized vehicle a substantial portion of the capital stack is financed through debt tranches that are comparatively less risky, with more predictable liquidity. Investors in these notes therefore require a lower return on their capital than equity holders: senior and mezzanine tranches typically pay a yield that is below PE equity hurdle rates, but at a premium to comparable corporate bonds and other asset-backed financing used in PE portfolios. By replacing a portion of high-cost equity with lower-cost rated debt, the structure lowers the vehicle's WACC even though the underlying assets are unchanged.

Diversification

Diversification is purposefully engineered into the structure of CFOs. Rating agencies such as Fitch Ratings and KBRA explicitly require that a CFO's collateral pool demonstrate sufficient diversification across fund managers, strategies, vintages, and geographies to achieve an investment-grade profile for senior tranches. Portfolios with greater diversification reduce modeled loss volatility, thereby enhancing credit stability at the senior-note level.^{lviii}

Improved liquidity

CFOs also present notable liquidity benefits, stemming both from the underlying collateral pool and from structural features. Because these vehicles typically pool fund interests across multiple vintage years (both mature and recently raised) cash flows from older assets begin to distribute earlier in the life of the transaction while younger vintages continue to mature. This form of diversification produces a smoother aggregate cash flow profile, effectively flattening the J-curve that characterizes traditional PE investing. Including secondary fund interests in the collateral pool can further reduce the J-curve effect.

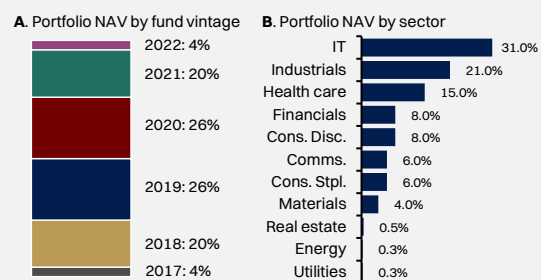
Beyond the nature of the collateral pool itself, a well-designed structured product incorporates mechanisms that maintain liquidity and safeguard timely payments even when underlying fund distributions are insufficient. Most CFO transactions include liquidity facilities or revolving credit lines that can be drawn upon to cover temporary shortfalls in cash to pay interest or expenses. The facility is typically repaid as soon as subsequent fund distributions are received, ensuring continuity of payments to noteholders without forcing asset sales.

Astrea 9: Private asset-backed CFO offering example

A real-world illustration of this principle is the Astrea 9 CFO transaction launched in 2025 by Azalea Asset Management, an indirect subsidiary of Singapore's Temasek Holdings. The \$1.625 billion Astrea 9 portfolio securitizes cash flows from 40 PE funds and satisfies the diversification thresholds that rating agencies view as essential for resilient collateral pools. As disclosed in the offering materials, the Astrea 9 portfolio is geographically diversified with 66% of portfolio NAV in the U.S., 26% in Europe, and 8% in Asia; and strategically balanced, with 83% of NAV in buyout funds and 17% in growth equity strategies.^{lix}

Astrea 9 also embeds meaningful vintage year diversification, spanning six fund vintages from 2017 to 2022 (**Figure 17A**), helping smooth exposure to funds at different points in the J-curve and formed during different macroeconomic environments. At the company level, the structure holds interests in 1,086 underlying portfolio companies, with no single position exceeding 1% of the total portfolio NAV. These exposures are spread across eleven industry sectors, reflecting broad sector diversification (**Figure 17B**).^{lx}

Figure 17: Diversification in Astrea 9 portfolio



This diversification across strategy, geography, sector, and fund vintage significantly mitigates idiosyncratic risk in the Astrea 9 portfolio. It is a key reason why all of its rated notes (Class A-1, A-2, and B) were assessed as investment grade by Fitch, reflecting the strength and resiliency of the collateral pool.^{lxi}



In addition, CFOs employ loan-to-value (LTV) and coverage triggers that reallocate cash flows or restrict equity distributions when collateral values fall below defined thresholds.^{lxii} By diverting proceeds towards debt amortization during periods of market stress, they preserve liquidity at the senior note-level and stabilize the CFO structure.

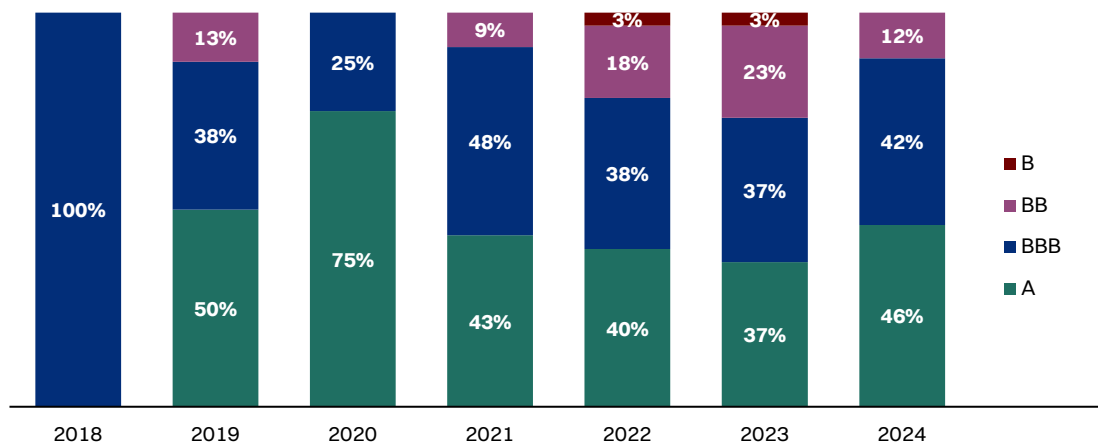
Through this combination of naturally cash-generative collateral and deliberate structural safeguards, private asset-linked structured products transform portfolios of illiquid private market assets into vehicles capable of delivering more regular cash flows, a defining feature of this class of products' growing appeal among investors.

Regulatory capital treatment

Institutional investors such as insurance companies must comply with strict regulatory capital rules, such as the U.S. Risk-Based Capital (RBC) regime^{lxiii} and Europe's Solvency II framework,^{lxiv} which require them to hold more capital against assets viewed as risky, volatile, or difficult to value. Direct commitments to PE funds fall into this category: regulators treat them as higher-risk exposures that require meaningfully more capital than investment-grade bonds or other publicly traded securities. For many insurers, these requirements represent a practical constraint on the size of their private market allocation. However, by converting PE interests into rated securities and transferring the first-loss and mezzanine risk to other investors, CFOs allow insurers to retain only the most senior notes, whose risk profile sits more comfortably within regulatory frameworks. Through this approach, CFOs help combat this regulatory constraint.

Recent market data from KBRA underscore the credit quality of CFOs. Between 2018 and 2024, KBRA assigned ratings to 152 tranches across 67 private-capital CFOs, totaling approximately \$37.6 billion of issuance, of which \$28.6 billion comprised rated debt.^{lxv} The majority of these rated tranches have been investment grade, confirming that CFOs are meeting the structural and credit standards required for regulated capital eligibility. In 2024, nearly 90% of all rated CFO debt tranches were graded A or BBB, levels that KBRA classifies as investment-grade (BBB- and above), as shown in **Figure 18**.^{lxvi}

Figure 18: KBRA's initial ratings on CFO tranches, 2018 – 2024



This observation has occurred alongside a broader evolution in the regulatory treatment of private asset-linked securitizations. In the U.S., the National Association of Insurance Commissioners (NAIC) recently finalized two measures directly relevant to fund-interest ABS. The first is a formal definition of a “bond” for regulatory capital purposes adopted in August 2024, which clarifies that securitized fund products such as CFOs may qualify as bond holdings under certain conditions.^{lxvii} The second is a ratings-challenge process,



also adopted in August 2024, that allows the NAIC or state regulators to review and override external ratings where warranted.^{lxviii} Together, these measures have reduced uncertainty around regulatory classification and capital treatment, with KBRA noting that the NAIC's actions have helped encourage greater participation by insurance capital in the fund-interest ABS market.^{lxix}

A similar development is underway in the U.K. In 2024, the Prudential Regulation Authority (PRA) revised the Solvency II matching adjustment framework to recognize assets with “highly predictable” cash flows, in addition to those with fixed cash flows.^{lxx} This change establishes a clearer regulatory pathway for certain private asset-linked structured products, provided that cash flows are demonstrably predictable, appropriately governed, and subject to supervisory oversight.

Taken together, these developments may suggest that global regulatory frameworks are increasingly recognizing distinctions between direct fund exposures and securitized structures with bond-like characteristics. To the extent that this evolution continues, it may enable regulated institutions to access private market exposure in a manner that is more compatible with modern capital efficiency requirements.

Drawbacks of securitization

While private asset-linked structured products like CFOs offer meaningful benefits, they also introduce complexities and structural considerations that investors should evaluate carefully.

Structural complexity and manager capability

Structured products are more complex than traditional PE fund commitments. Their performance depends not only on the underlying private market assets but also on their structural design and ongoing management. Sponsors must have strong cash flow modeling capabilities, underwriting skill, collateral management, and waterfall monitoring capabilities, among others.^{lxxi} It is for these reasons rating agencies note (using the example of CFOs) that portfolio composition, manager quality, and governance controls are key determinants of credit performance.^{lxxii}

Use of leverage

Many private asset-backed products employ structural leverage. In the case of private asset-backed CFOs, this means that the subordinated / equity tranche is economically exposed to a leveraged claim on the underlying private market collateral. The structure issues both debt and equity securities, and the equity tranche effectively borrows from the debt tranches: equity investors receive the residual cash flows after interest and principal payments on the notes, amplifying both gains and losses. In other words, the subordinated / equity tranche functions as a leveraged position on a diversified pool of private market assets, with the debt tranches acting as the source of the embedded leverage.

According to Fitch Ratings' 2025 Private Equity Collateralized Fund Obligations Rating Criteria, equity notes serve as the first loss position, absorbing any reduction in NAV before losses migrate to more senior classes.^{lxxiii} Junior or mezzanine tranches sit above the equity tranche but still provide loss absorption for senior tranches through subordination. The interaction between leverage, portfolio NAV volatility, and the liability structure is an important determinant of CFO risk: Fitch explicitly notes that the combination of NAV volatility and the structure of liabilities is used to assess the credit risks of the notes.^{lxxiv}

In addition to structural leverage within private asset-backed product itself, some portion of the underlying assets may also incorporate other forms of financial leverage, such as subscription credit lines, NAV facilities,



and other fund-level financing tools. The use of these facilities may amplify both return dispersion and sensitivity to valuation changes. When leveraged fund exposures are pooled into a structured product, they may interact with the product's own structural leverage, potentially compounding sensitivity to valuation declines, liquidity pressures, and refinancing risk.

Regulatory scrutiny and evolving capital treatment rules

Private asset-linked structured products operate within regulatory frameworks that continue to evolve. Changes in whether senior CFO tranches qualify for bond treatment, how cash flow predictability is assessed, or ratings agency criteria for investment-grade classifications could materially affect investor demand, particularly among insurers and other regulated institutions.

While global regulatory frameworks have recently shown a greater willingness to differentiate between direct private market exposures and securitized products with bond-like characteristics, such developments are not guaranteed to be permanent or uniform across jurisdictions. Increased regulatory scrutiny could result in tighter eligibility criteria, higher capital charges, or more conservative supervisory overlays, especially if market growth outpaces regulatory comfort. As a result, the regulatory treatment of private asset-linked structured products remains sensitive to changes in policy direction and jurisdiction-specific implementation, introducing an additional layer of complexity for both issuers and investors.

Trigger mechanics and liquidity management risk

Private asset-linked products like CFOs rely on structural triggers, such as LTV ratios, coverage tests, and cash flow sufficiency triggers, to protect senior noteholders. While these mechanisms are critical for credit stability, they can also restrict equity distributions, force early or partial principal redemption, or suspend payments through payment-in-kind (PIK) features if the collateral underperforms.^{boxv} In severe environments, liquidity facilities may be drawn more extensively than modeled, or structural protections may divert cash away from subordinated investors for extended periods.

Dependence on external credit ratings

Because CFO demand, particularly for senior tranches, is closely tied to obtaining an investment-grade rating, the structure is dependent on rating agency methodologies. If rating criteria tighten, collateral assumptions change, or rating agency stress scenarios become more conservative, the economics of issuing CFO notes may shift materially. This dependence introduces a form of risk: rating outcomes hinge not only on the performance of the underlying assets but also on the rating agency's views on correlation, distribution timing, and portfolio diversification.

These considerations underscore that while private asset-linked structures like CFOs offer distinctive advantages, they require careful evaluation of structural leverage, modeling assumptions, and manager expertise.

Considerations around risk, return, and diversification in private asset-backed structured products

In terms of risk and return, private asset-backed structured products occupy a unique position between traditional public and private market returns. By transforming diversified pools of private market assets into tranches of debt and equity, these products create a continuum of risk-return profiles that can complement



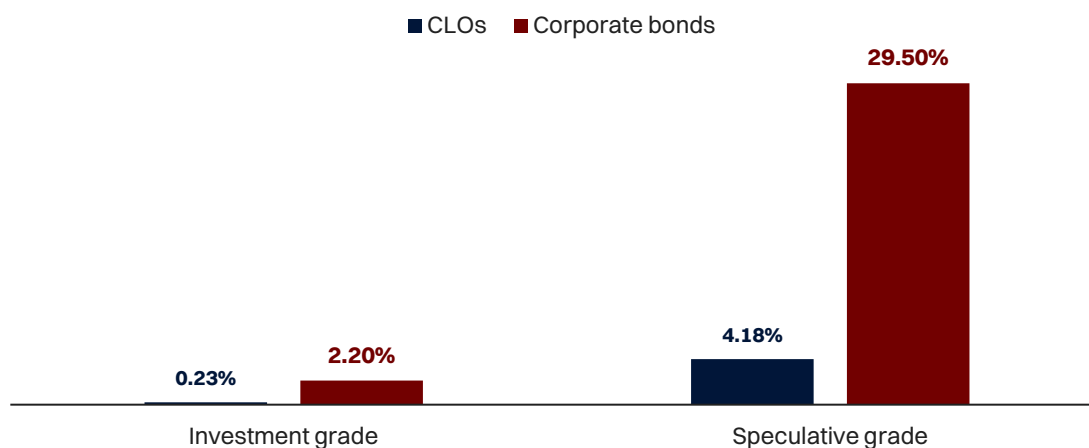
both public and private market allocations. Throughout this section, we use the example of a CFO to examine how structuring techniques redistribute risk, reshape return profiles, and enable investors to target exposures ranging from investment-grade credit to levered equity.

Senior notes: Investment-grade credit characteristics and predictable returns

Senior CFO notes are designed to behave like high-quality credit instruments. While long-term historical default data for CFOs is limited, a useful benchmark comes from collateralized loan obligations (CLOs), a more established securitized product employing similar structural protections. Although CLOs mainly securitize senior secured loans rather than private asset interests, their liability structures are designed using the same credit-enhancement techniques used in CFOs.

The historical performance of CLO senior tranches provides a relevant empirical reference point. Over multiple decades of issuance, investment-grade CLO tranches have exhibited exceptionally low cumulative default rates (0.23% only) compared with 2.20% for investment-grade bonds (**Figure 19**). Even in speculative-grade categories, CLO default rates (4.18%) remain significantly lower than those of equivalently rated corporate issuers (29.50%).

Figure 19: Cumulative default rates for CLOs (1993 – 2023)^{lxxvi} and corporate bonds (1998 – 2023)^{lxxvii}



This comparison does not imply that CFOs and CLO collateral risks are the same; rather, it highlights that when securitized products are built on diversified, resilient collateral pools, their structural protections can play a decisive role in supporting the strong credit performance of senior notes. This can be seen again using the example of the Astrea 9 CFO. 10,000 Monte Carlo simulations of Astrea 9's collateral PE portfolio, generated under a range of stress tests, resulted in all note classes being fully repaid in 100% of scenarios.^{boxviii} Although these model-based results are not directly comparable to historical default statistics, they reinforce the same conclusion: credit enhancement, subordination, and portfolio diversification materially strengthen the resilience of senior tranches in private market securitizations.

With limited upside (capped by coupon rates) and very low expected loss rates, senior CFO notes can function as high quality, yield-enhanced credit instruments, offering a favorable return profile that appeals to insurers, investment-grade credit allocators, and asset-liability matching investors seeking incremental yield relative to traditional investment-grade bonds.

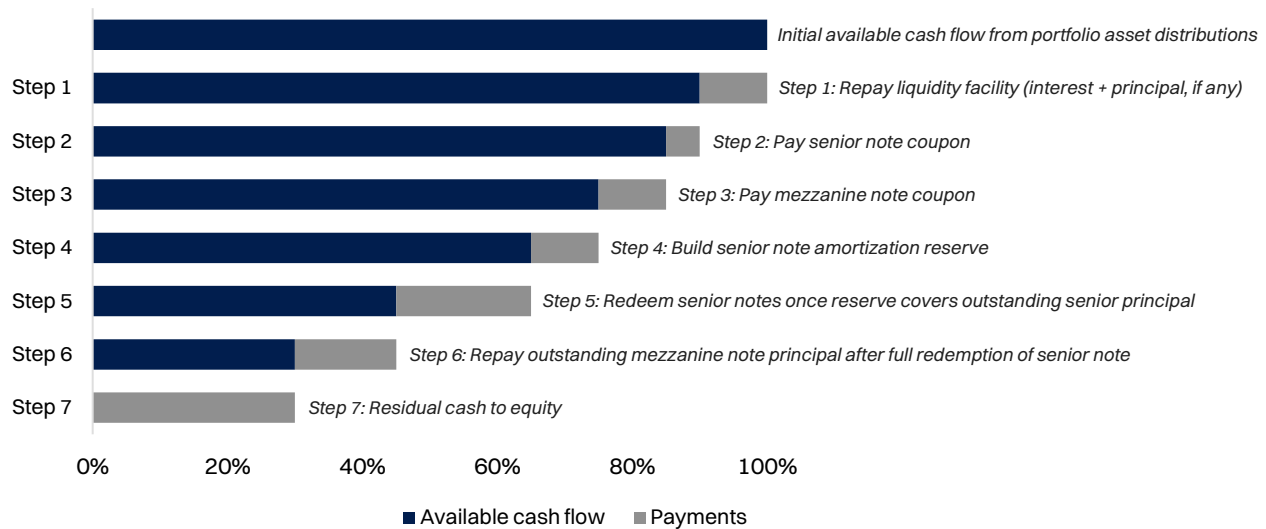


Subordinated and equity tranches: Leveraged exposure to private market returns

Subordinated and equity tranches sit beneath the senior notes and absorb losses first. While subordinated notes may carry a stated coupon, both subordinated and equity tranches participate materially in the upside of the underlying private asset portfolio. As a result, their return profile is driven by a combination of collateral performance, structural leverage, and the timing of cash flows within the CFO waterfall. This makes the junior capital stack appealing to investors seeking private market-like return potential, but who prefer the structural protections, transparency, and potential liquidity advantages of a securitized format relative to direct fund commitments.

To illustrate the mechanics of this exposure, below is a simulation analysis of a representative CFO structure.^{lxxxix} The underlying portfolio used in the CFO simulation analysis consisted of vintage-diversified allocations to buyout, growth equity, VC, and private credit strategies.^{lxxx} A simple CFO structure consisting of 60% debt (50% senior, 10% mezzanine) and 40% equity capital was then overlaid on top of the portfolio. Cash flows were allocated each period according to a simple transaction waterfall structure (shown in **Figure 20**), with senior coupon and principal repayment supported by a liquidity facility and a scheduled amortization reserve, in case the underlying portfolio failed to generate sufficient cash flows to cover required obligations.^{lxxxi}

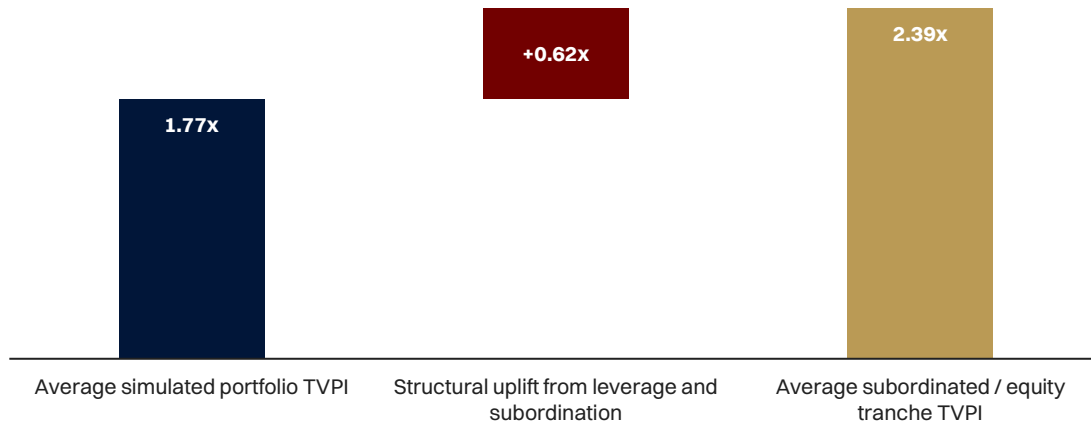
Figure 20: Simple transaction waterfall structure



Across these simulations, the underlying portfolios generated an average TVPI of approximately 1.77x. After overlaying the CFO structure, however, the equity tranche produced a higher average TVPI of roughly 2.39x. The difference reflects the structural leverage inherent in the CFO design: cash flows to equity holders are amplified because the equity tranche receives all residual distributions after the senior and mezzanine notes have been fully serviced in each period. **Figure 21** illustrates this structural effect by comparing the average TVPI of the underlying portfolios against the average TVPI of the equity tranche at the CFO's maturity date (15 years). The "uplift" represents the degree to which securitization redistributes performance convexity to the equity position.



Figure 21: Structural TVPI uplift of equity tranche within a stylized CFO structure



While the expected return to the equity tranche is higher than the expected return of the underlying portfolio itself, the dispersion of returns to equity tranche holders is also materially wider. Across simulations, the standard deviation of underlying portfolio TVPIs was approximately 0.29x, whereas the standard deviation of equity tranche TVPIs was roughly 0.73x. This reflects the fact that junior tranches bear residual exposure to the full volatility of the underlying private asset cash flows, and are exposed to the full swing of outcomes once senior obligations have been met.

Taken together, these dynamics highlight the essential economic character of subordinated and equity CFO tranches. They bear the first losses and therefore carry more risk; yet they also participate in a disproportionate share of the upside when portfolio performance is strong. Their ultimate risk-return profile is shaped not only by the fundamentals of the underlying collateral but also by structural design choices, such as tranche sizing, interest-coverage mechanisms, amortization rules, and levels of overcollateralization, which determine how cash flows and losses are distributed across the capital stack.

For investors seeking levered exposure to diversified private asset portfolios while mitigating illiquidity, administrative complexity, and the uncertain, long-term investment horizons that come with direct allocations, junior CFO tranches can serve as a flexible alternative. However, their performance remains sensitive to both collateral outcomes and structural parameters, underscoring the importance of careful tranche construction, stress testing, and manager ability.

While CFO tranche design determines how cash flows are allocated among investors, the performance of any securitized product ultimately depends on the quality and behavior of its collateral. In CFOs (and in private asset-linked structured products more broadly) the collateral pool drives both expected cash flow availability and the volatility that propagates through the capital structure. As a result, understanding the sources, composition, and maturity profiles of the underlying fund interests is as important as understanding the structure itself.

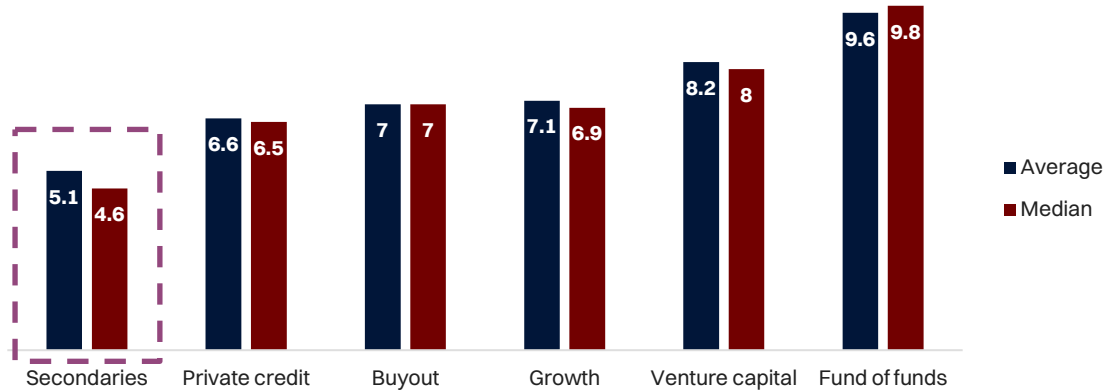
Collateral pool construction: A primary driver of CFO performance

Given the importance of cash flow timing to service debt repayments in private asset-backed CFOs, secondary fund interests have become a preferred form of collateral for many private asset-backed securitized structures^[xxix]. This is likely due to secondaries' tendency to produce cash distributions more quickly, improving the ability of the structure to meet interest and principal payments, which is an essential feature when rated notes represent a large share of the capital stack.



The shorter time-to-liquidity of secondary portfolios is also well documented. In an analysis of more than 600 private market transactions over the past two decades, secondary fund interests reached a distribution-to-paid-in (DPI) ratio of 1.0 (representing a cash return of capital) in approximately 5.1 years, materially faster than most primary strategies (**Figure 22**). The accelerated return of capital is particularly valuable in a CFO framework, where earlier cash flows strengthen coverage ratios, reduce financing risk, and support more robust rating outcomes.

Figure 22: Time to return investor capital (DPI = 1.0) by strategy^{lxxxiii}



While secondary fund interests offer clear structural advantages, the optimal CFO collateral pool often includes a thoughtful blend of secondary and primary fund exposures. For instance, a mix of secondary private credit interests can provide steady near-term cash flows, while primary commitments to high-quality buyout or growth managers introduce long-term NAV appreciation and equity-upside potential.

Ultimately, the composition of a CFO's collateral pool should align with the CFO's liability structure. Senior note-heavy CFOs benefit from higher allocations to secondary interests to ensure robust debt service coverage, while structures with larger equity tranches can accommodate more primary exposure to capture the return potential of early-stage funds. This alignment between assets and liabilities is a key driver of overall CFO performance, and an important consideration for both issuers and investors.

Conclusions

Private markets have become an essential component of institutional portfolios, offering compelling long-term returns relative to traditional public assets. Yet the structural realities of the asset class, including illiquidity, uneven cash flows, valuation lags, and wide dispersion in manager performance, create challenges for investors seeking to build resilient, well-diversified programs. Analyses in this paper show that while diversification across portfolio size, strategy, vintage year, sector, and geography reduces idiosyncratic risk; diversification cannot eliminate exposure to macroeconomic conditions or overcome the operational frictions that arise from capital pacing in private asset strategies, minimum commitment sizes to funds, and fundamentally limited liquidity.

Private asset-linked structured products, such as CFOs, have emerged alongside the growth of the asset class as a mechanism to reallocate private market risk more efficiently. Market activity indicates that these structures are gaining traction, particularly among investors seeking defined risk-return profiles, improved cash flow predictability, and enhanced regulatory capital efficiency. From an economic perspective, CFOs facilitate risk transfer by redistributing cash flow volatility and loss exposure across tranches through



contractual subordination, overcollateralization, and structural protections. Senior investors obtain exposure that more closely resembles investment-grade credit, while junior investors assume residual risk and upside that remains directly linked to underlying portfolio performance. In this sense, CFOs translate existing diversification within private asset portfolios into differentiated, investable outcomes aligned with the constraints and objectives of distinct investor classes.

These benefits, however, are not guaranteed. CFOs introduce structural complexity, require robust modeling, and are sensitive to collateral composition. As a result, outcomes depend critically on manager experience across market cycles, portfolio construction expertise, and alignment between the sponsor and the structure's risk-bearing tranches. Without these, the theoretical advantages of diversification and securitization may fail to materialize in practice.

Viewed through this lens, CFOs are neither a substitute for thoughtful portfolio construction, nor purely an exercise in financial engineering. Rather, they are an evolving tool that can enhance diversification, transfer risk, and improve capital efficiency when deployed by experienced managers with appropriate incentives and controls. As private markets continue to scale and investors seek solutions that balance return objectives with diversification, liquidity, and regulatory considerations, the role of private asset-linked structured products is likely to expand, alongside increasing scrutiny of their execution quality in practice.



About the authors

Josh Lerner is the **Jacob H. Schiff Professor at Harvard Business School** and Co-Director of the HBS Private Capital Project. Much of his research focuses on venture capital and private equity organizations and innovation policy. He has been recently recognized as among the forty most influential economists worldwide by ScholarGPS and research.com.

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Bella Private Markets was founded by Josh Lerner in 2010 to focus exclusively on providing solutions to the challenges facing the private capital industry. Bella combines rigorous academic approaches with real world industry expertise to provide actionable insights for our clients. We focus on complex, customized projects that require thorough analysis, whether quantitative or qualitative in nature, to help our clients improve performance, optimize operations, and chart winning strategies for the future.

We serve as trusted advisors to the senior management of organizations across the private market landscape, including fund managers, asset owners, and other market participants interested in funding innovation and entrepreneurship. Our expert team works closely with clients to provide highly tailored solutions to their most complicated problems.

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Endnotes

ⁱ Private capital includes the strategies of private equity, venture capital, private credit, real estate, infrastructure, and natural resources. This number does not include secondaries and fund-of-funds to avoid double-counting. Source: Preqin, "Private Markets in 2030," October 16, 2025.

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^{bxi} The simulated portfolios were generated using Bella Private Market's proprietary historical simulation model, which constructs forward-looking private equity portfolio cash flows and NAVs. For more information, please see Beutler et al. (2023), "Takahashi-Alexander Revisited." The forecasted cash flows and NAVs were constructed using historical private equity and private credit fund cash flow data from Preqin, last accessed November 17, 2025.

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^{bxi} The stylized collateralized fund obligation (CFO) waterfall payment used in the analysis followed a simplified version of the mechanics common in private equity-backed securitizations:

1. Collateral cash flows (distributions minus capital calls, plus terminal NAV) arrive each period.
2. Liquidity facility interest accrues on any previously drawn balance.
3. Liquidity facility repayment: available cash repays any outstanding facility balance (principal + accrued interest)
4. Senior note coupon is first paid in each period. Any shortfall triggers a liquidity facility draw to ensure timely interest.
5. Mezzanine note coupon is paid after senior coupon, also supported by the liquidity facility in the event of shortfall.
6. Senior reserve ("scheduled amortization"): each period, the model increases the required reserve amount; available cash fills this reserve on a catch-up basis.
7. Once the reserve equals remaining senior principal, senior notes are redeemed in full.
8. After senior repayment, remaining cash amortizes mezzanine principal.
9. Any remaining cash in each period flows to the subordinated / equity tranche.

This CFO waterfall is not intended to replicate any particular market transaction, but rather to capture the core mechanics by which CFO structures reallocate cash-flow timing and distribute leverage across the capital stack.

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