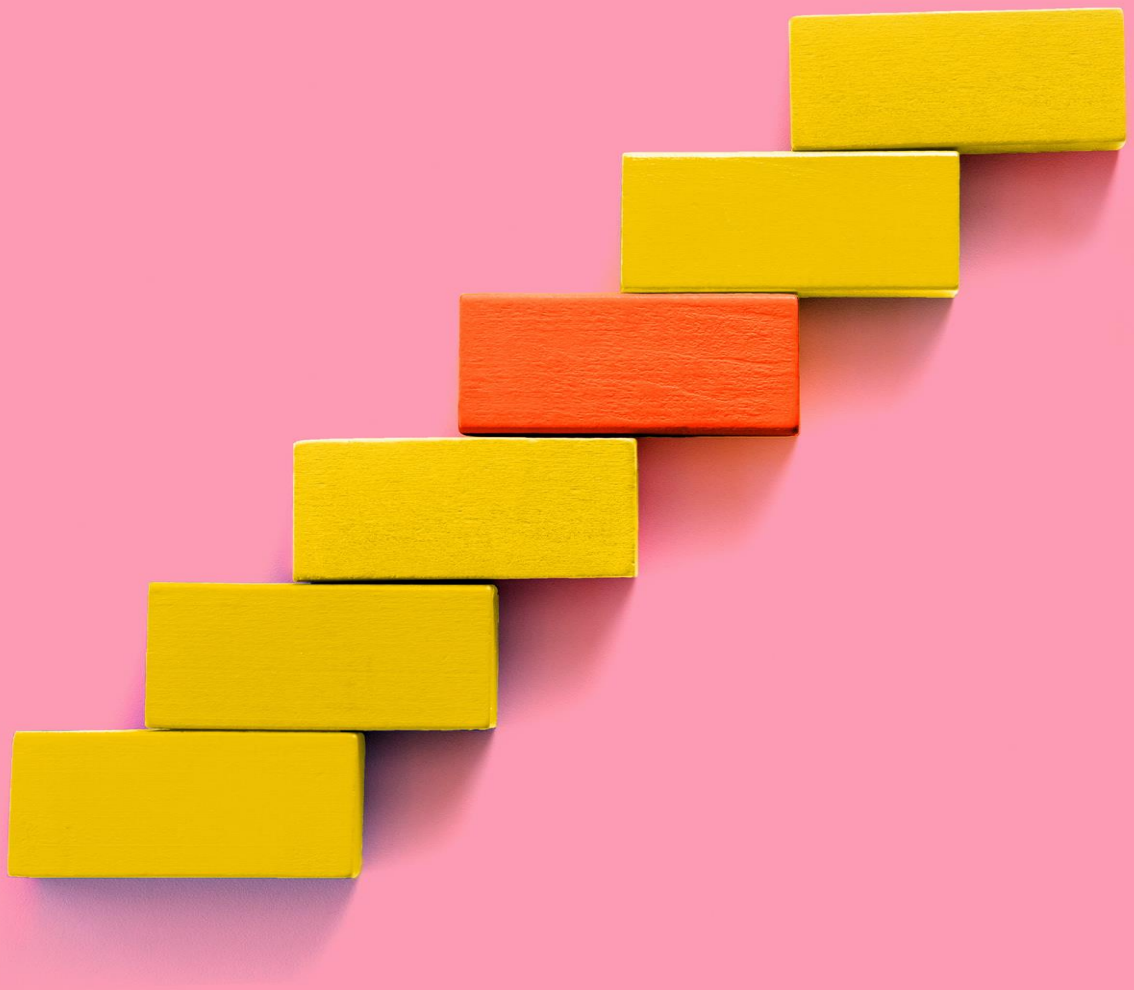
BlackRock

Implementing Private Markets in Wealth Portfolios

Tools for a new market environment

October 2024



FOR QUALIFIED PURCHASERS, PROFESSIONAL CLIENTS, SOPHISTICATED INSTITUTIONS, QUALIFIED INVESTORS, AND INSTITUTIONAL & WHOLESALE INVESTORS

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A practitioner's view

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Key takeaways

- Private assets are one of the fastest-growing segments of the global capital markets and an essential part of portfolio construction.
- Wealth portfolios have historically been underinvested in private markets, largely due to a lack of appropriate investment vehicles.
- Successful private markets investing depends on diversification among assets and managers, as well as the ability to capture relative value and maintain steady deployment.
- When investing in private markets, wealth investors should take a whole-portfolio approach with a plan for managing liquidity risk, market risk and manager risk.
- Evergreen structures, such as ELTIFs, allow wealth practitioners to address the considerations unique to private markets, and build and maintain meaningful allocations.

Private markets are no longer an “alternative” asset class.

In fact, they are becoming more crucial to diversifying a portfolio than ever before.

In the past, wealth investors could rely on stable strategic asset allocations across equities and fixed income. But the four-decade-long Great Moderation is over. In a regime of increased volatility, broad allocations to listed equities and bond indexes can unnecessarily limit the risk-adjusted returns of wealth portfolios.

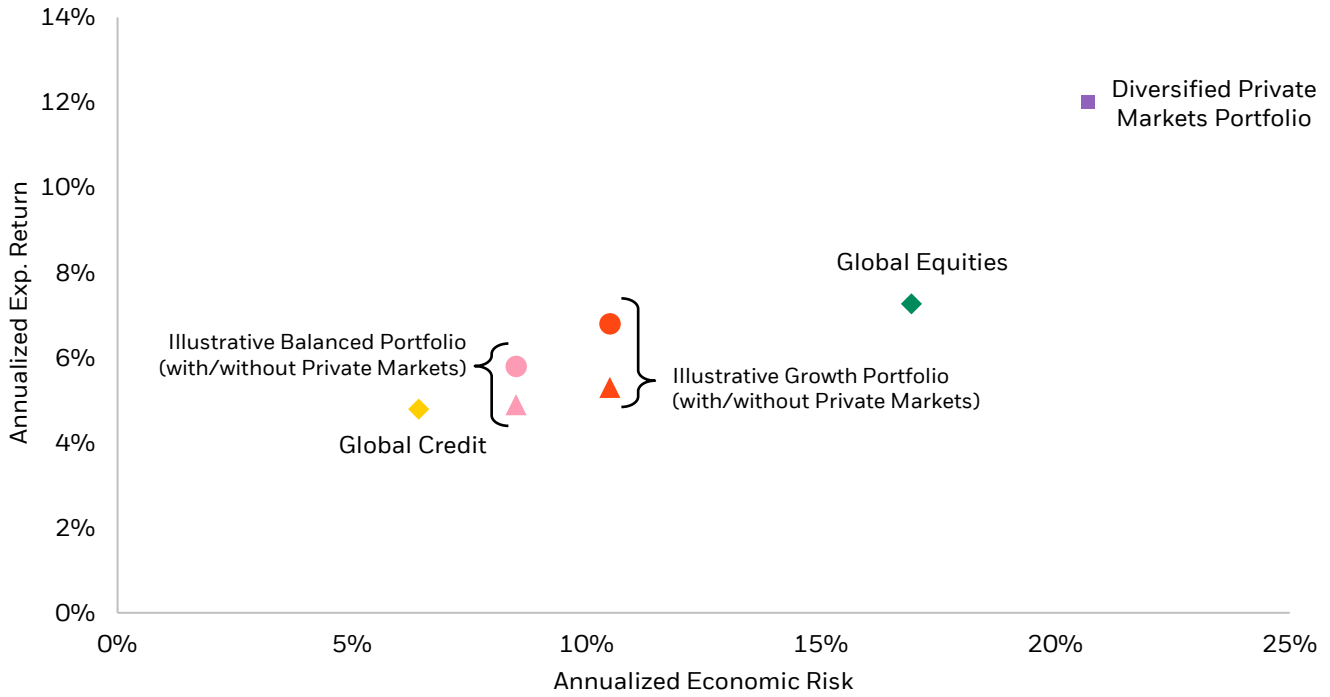
On the other hand, private markets can offer much-needed diversification through the broader opportunities that private markets have to offer. With around 87% of US companies over $100 million in revenue being privately owned[1], private market investments can offer access to markets where public investments are limited, and greater diversification into non-correlated asset classes.

Furthermore, as the nature of private markets continues to evolve, so have the opportunities that are available. For example, the global low-carbon transition is expected to require $4 trillion of capital investment per annum[2], and private capital will be pivotal in financing the development of crucial infrastructure.

But allocating to private markets brings a host of new questions for wealth investors. They may not know much about the opportunities and risks of private assets, how to access them, how to fit them into a portfolio, or how much to allocate. The answers are unique to each investor. This paper is designed to help effectively frame those questions and offer a few answers.

What private markets can do

An allocation to private markets can help enhance portfolio risk and return.



Source: BlackRock, as of June 2024. For illustrative purposes only. Risks are calculated in collaboration with Aladdin and BlackRock’s Risk & Quantitative Analysis team. Return assumptions from the public markets assets are derived from BlackRock’s Capital Market Assumptions (CMA’s) and private market assets are derived from BlackRock estimates and targets for each underlying strategy. [1]Capital IQ, BlackRock as of Dec. 31, 2023, [2]BlackRock investment Institute, 2024. **There is no guarantee that any forecasts made will come to pass. Past performance is not a reliable indicator of future performance.**

Core considerations

Private markets come with unique characteristics. When investing, there are a handful of elements that wealth practitioners should consider to make the most of their allocations.

Liquidity and opportunity

Public markets can face liquidity challenges in stressed environments but are largely liquid in normal conditions. Private markets, on the other hand, have an inherent illiquidity. Managing those assets while delivering the liquidity a client needs is vital for practitioners.

While private markets are less liquid, they have historically made up for that with higher returns, sometimes called a liquidity premium. Over the past decades, we have seen the liquidity premium come to life, with private markets outperforming their public counterparts.

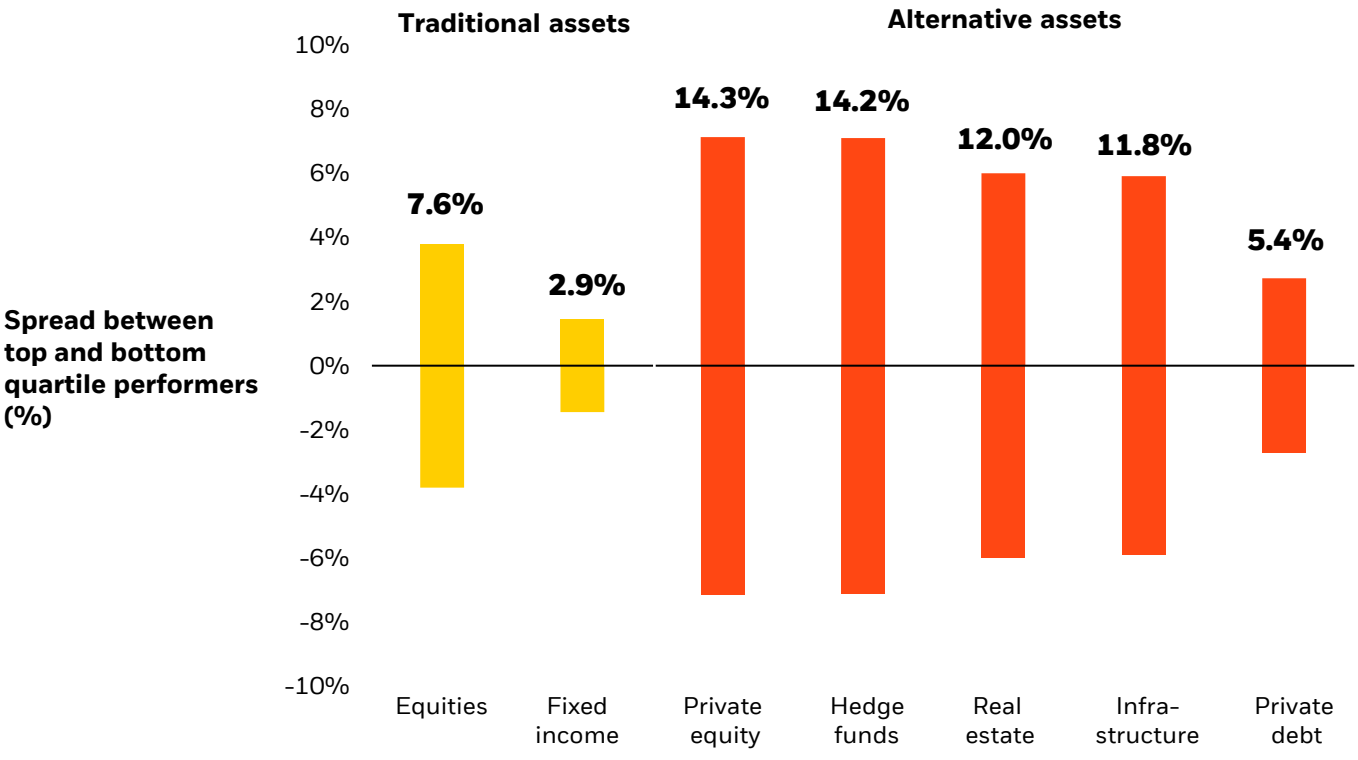
Manager selection

Within many private asset classes, the dispersion of returns among managers can be dramatic, especially in private equity. This is largely driven by differences in the sourcing and underwriting capabilities among managers, as well as the high degree of variance in deal-by-deal performance.

Access to a wide network of managers is crucial to achieving optimal returns. In asset classes with a narrower range of outcomes, such as private debt, the need for manager diversification is reduced and can be traded off for cost benefits and greater operational efficiency.

A wide range

There is a high degree of performance dispersion of returns within private markets asset classes.



Source: BlackRock Investment Institute with data from Morningstar, Pitchbook. 31 December 2022. Notes: The chart shows the distribution of historical returns net of fees for Fixed Income, and Equity (Large Cap Equities). Fixed Income and Large Cap Equities funds are represented by U.S.-domiciled funds tracked by Morningstar. Private Equity, Real Estate, Infrastructure (Real Assets) and Private Credit (Private Debt) represented by Pitchbook's Global Fund Performance Report as of 31 December 2022. Private Equity, Real Estate, Infrastructure (Real Assets) and Private Credit (Private Debt) distribution of historical returns are net of fees from 1 January 2004 -31 December 2022. Chart is for illustrative purposes only and does not represent the actual performance of any BlackRock portfolio. **This is not a recommendation to invest in any particular financial product.** Indices are unmanaged and one cannot invest directly in an index. **Past performance is not a reliable indicator of future performance.**

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Investing across vintages

Timing is important in private markets. For example, private equity buyout funds can provide strong returns over the course of an entire investment cycle, but they tend to deliver limited returns at first. This is commonly referred to as the J-curve, during which a fund deploys capital and works with the management teams of portfolio companies to improve their business operations and valuations.

Investing through the secondary market, however, can deliver an immediate markup in these funds by acquiring them at a discount to NAV, while accessing more mature assets that are closer to their exit prices.

By blending new funds and offerings purchased on the secondary market, investors can stabilize a portfolio's returns.

Market risks

Many investors believe private market assets perform badly during downturns, given that they're often smaller, less-mature companies. But this isn't necessarily so. The structure of private markets investments can provide a buffer when multiple investors simultaneously seek to withdraw their capital.

During the global financial crisis, the well-understood illiquidity of private market assets protected them from widespread redemptions by cash-strapped investors. At the same time, the un-allocated capital - or dry powder - available to private-fund managers can serve as a buffer during economic downturns. That liquidity enables private markets funds to provide equity injections to companies at times when competitors may falter.

At the same time, though, private assets can lose value. And investors seeking to sell out of private funds ahead of their liquidation often have to sell at a significant discount to the fund's NAV.

Diversification

That said, the performance across private asset classes oscillates through time as market conditions change.

For example, after years of meaningful outperformance driven by low interest rates and supportive IPO and M&A markets, private equity performed poorly in 2022 and 2023.

In the same period, however, infrastructure delivered strong returns. This demonstrates the ways in which private markets are not just one asset class, but several, requiring diversification over time.

Investing across asset classes also helps investors maintain a steady deployment pace, as different funds don't always find attractive opportunities. Annual private equity deal flow dropped by nearly half between 2021 and 2023 while private credit deal flow remained relatively steady across the same period.

New year, new opportunity

Different private asset classes outperform in different environments.

2019	2020	2021	2022	2023
Buyout 16.1%	Buyout 21.1%	Buyout 44.1%	Infrastructure 9.7%	Infrastructure 10.9%
Private debt 8.3%	Infrastructure 7.7%	Value-add real estate 27.2%	Value-add real estate 7.5%	Buyout 10.9%
Value-add real estate 7.6%	Value-add real estate 3.9%	Private debt 17.4%	Private debt 5.5%	Private debt 9.2%
Infrastructure 7.0%	Private debt 3.2%	Infrastructure 16.1%	Buyout -0.6%	Value-add real estate -4.2%

Source: PitchBook, as of December 2023. IRR is a discount rate that makes the net present value (NPV) of all cash flows equal to zero in a discounted cash flow analysis. Underlying performance is representative of a broad set of funds. **Past performance is not a reliable indicator of future performance.**

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Implementation – getting it right

Navigating the private markets and incorporating them into a whole portfolio isn't simple. But with the right tools, structures and partners, it's more manageable than ever.

How much should wealth clients allocate to private markets? The right answer is an approach that boosts return while controlling downside risk – both in terms of market outcomes and meeting the client's liquidity requirements.

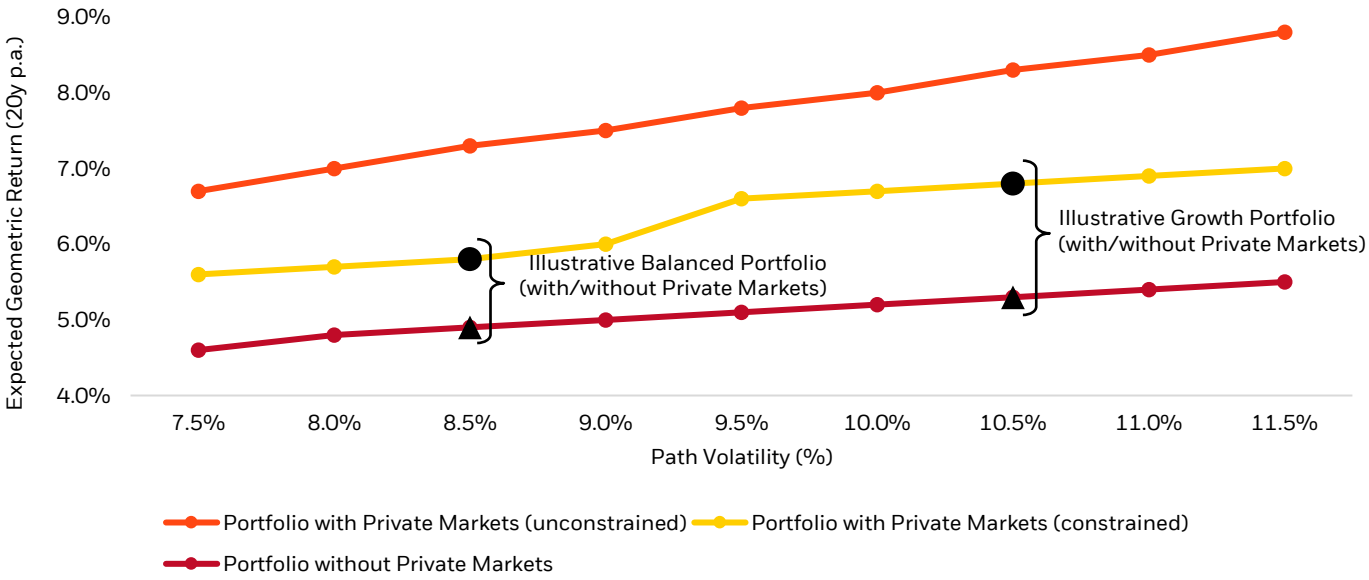
We use BlackRock's Capital Market Assumptions to create an efficient frontier for portfolios - with and without private markets allocations. The models we use operate on the following assumptions.

The public-investment portion of the portfolio is modelled as allocating to global equity and global fixed income, targeting expected risk between 8.5% and 10.5%. The private markets portion is modelled as a multi-alternative fund with allocations to private equity, private debt, infrastructure and real estate, along with a 20% liquidity buffer.

In the example below, we've optimized the portfolios with private assets to target the same risk as their public-only counterparts, for easier comparison. To reflect common industry practices, we have capped allocation to private markets at 15% for portfolios with risk up to 9% and 25% for portfolios with risk higher than 9%.

Finding the optimal allocation

Return upside and liquidity requirements are key considerations in sizing private markets allocations



Asset	8.5% Risk Portfolio with Private Markets	10.5% Risk Portfolio with Private Markets
Global Equity	36.0%	41.1%
Global Government Bonds	24.2%	14.0%
Global IG Credit	14.5%	11.3%
Global Inflation Linked Bonds	1.4%	1.0%
Global Sub IG	8.9%	7.6%
Private Markets	15.0%	25.0%
Total	**100.0%**	**100.0%**

Source: BlackRock, as of June 2024. For illustrative purposes only. Risks are calculated in collaboration with Aladdin and BlackRock's Risk & Quantitative Analysis team. Return assumptions from the public markets assets are derived from BlackRock's Capital Market Assumptions (CMA's) and private market assets are derived from BlackRock estimates and targets for each underlying strategy. **There is no guarantee that any forecasts made will come to pass.**

Modelling and management

Private markets offer less transparency, and an investor needs to employ more sophisticated methods when choosing investments.

In private equity, we use aggregate buyout transaction data and portfolio company growth rates in the U.S. and Europe to model a hypothetical balance sheet and income statement for the overall buyout universe. Whether employing bottom-up or top-down models, we base our analysis on third-party fundamental data. We believe this approach captures the essentials and dynamics relevant to each asset class.

We use those return assumptions to determine an appropriate allocation to each asset class. There is no "average" private fund manager, while there is a wide dispersion of returns across managers. Understanding the alpha potential in private markets – the ability of some fund managers to outperform the average – is crucial.

In private equity, we use the present value of cash flows based on an equity discount rate – the S&P 500's total return – to compare funds. We calculate the alpha of each fund as the ratio of the present value of cash distributions to capital calls. These figures allow us to compare performance across funds. We find that the extra returns delivered by top-quartile PE buyout managers relative to median managers has decreased over time.

Our results now allow us to go a step further in asset allocation by directly comparing the alpha in public and private markets. We find the alpha potential in private markets has historically been greater than public markets when making a like-for-like comparison.

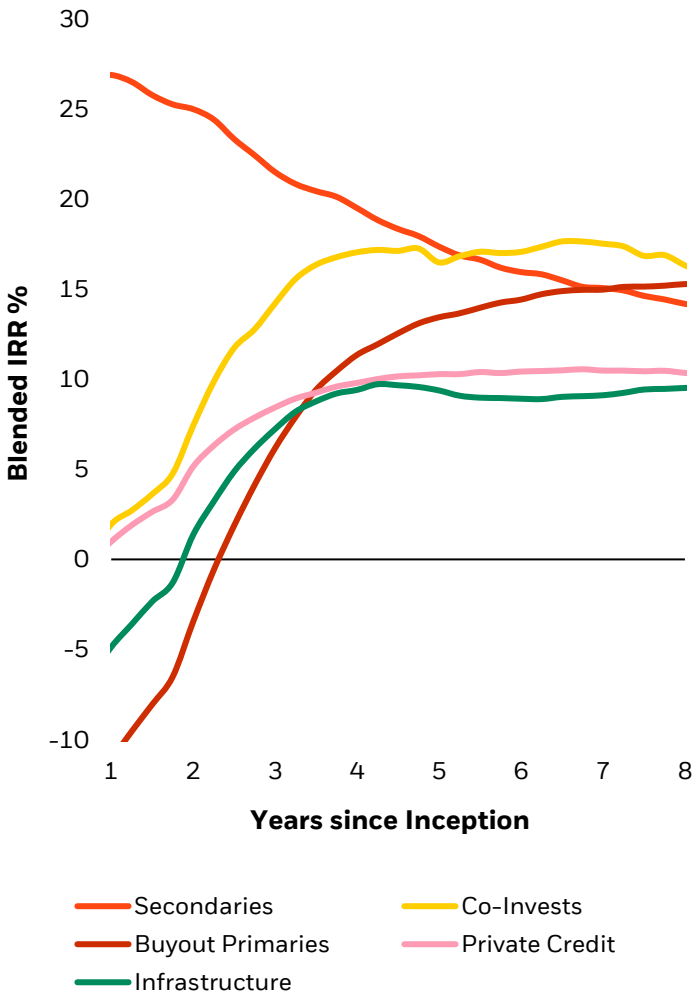
This may bias an investor's allocation to private markets relative to any optimization based on the assumed returns from average fund managers. Costs are part of the equation – not just fees but the overall governance costs of picking and overseeing alpha-seeking managers.

Stabilizing returns

Private market investments often experience a J-curve, in which the returns on private market investments begin low and increase over time. This is generally true for buyout funds and some other strategies. But it doesn't apply to secondaries funds and private debt, which can generate returns from day one. This is why combining strategies and asset classes within a portfolio can help investors generate consistent returns.

A blended path

Implementation choices can drive performance and mitigate private market j-curve.



Source: BlackRock, Preqin, as of June 2024. For illustrative purposes only. Data is reflected from individual asset class indices, using data from 1980 to 2023. IRR is a discount rate that makes the net present value (NPV) of all cash flows equal to zero in a discounted cash flow analysis. Underlying performance is representative of a broad set of funds. **Past performance is not a reliable indicator of future performance. The inclusion of fees and charges will reduce the overall return received by the investor.**

Investment approaches

When building a private market portfolio, investors can choose how hands-on they want to be, with three main options:

Direct

Investors can source and underwrite investments in individual companies or assets. The investor has maximum control, but is limited by their own sourcing, research and management capabilities.

Co-invest

Alongside an asset manager, an investor can co-invest in a single company or asset. The investor retains control on asset selection but delegates some sourcing and underwriting.

Third-party funds

Making commitments to third-party funds offers greater diversification, but comes at the cost of control on asset selection. To diversify across vintages, investors can buy funds on the secondary market.

Accessing private markets

Despite the benefits of private markets, access by wealth investors has historically been limited due to the lack of appropriate structures, and an industrywide preference for closed-end funds, which are less suitable for wealth investors.

Closed-end vehicles require deployment and realization cycles where investors make multiple commitments. This is not only an operational challenge, but also comes with opportunity costs, as many private funds never fully invest.

Recently, more managers have started offering so-called evergreen structures to the market, which allow investors to simplify the commitment process and can sometimes achieve diversified private markets exposure through a single investment. Evergreen fund managers can also provide liquidity by adding liquid exposure to their private market investments, and by building in robust liquidity-management processes.

Managing allocations

Achieving and maintaining private exposures has been a challenge for wealth practitioners in the past, especially with traditional closed-ended funds. The operational complexity of private markets commitments and withdrawals, has discouraged many distributors from offering these types of strategies.

But new innovations in evergreen structures, notably the ELTIF for private markets investments, allow investors to simplify the process of making commitments to private funds. In addition to simplifying commitments, evergreen funds often include an element of limited liquidity to allow wealth investors to realize their private markets gains on a regular basis.

These evergreen structures have other advantages when it comes to managing a client's allocation to private markets, including a clearly defined cycle for subscriptions and redemptions, straight-through-processing of orders that remove most manual intervention, and simplified capital calls.

These new evergreen structures allow wealth practitioners to design their product offering to include core exposures across each private markets asset class, streamlining the due diligence process.

Historically only possible for institutions, wealth investors can now also benefit from consistent exposure to private markets over long periods of time. They can stay invested in the same fund and hold it for 15 years, rather than continuously having to identify new funds to invest in.

Integrating private markets in the whole portfolio

In the previous sections we have highlighted the benefits of integrating private markets in investor portfolios as a means of enhancing risk-adjusted returns and discussed the modelling required to do so. However, due to the nature of private markets, risk and returns form only one part of the picture, as investors also need to consider the dimension of liquidity.

Understanding an investor's liquidity needs is a fundamental consideration in determining the tolerance for holding what is an inherently illiquid exposure as part of a broader portfolio.

A focus on liquidity

Private market assets trade far less frequently than their public counterparts. This liquidity risk can be significant, and it's something we manage by simulating possible scenarios to project a portfolio's ability to meet estimated outflows without a significant detriment to the portfolio.

Our simulation takes into account a portfolio's allocation to private markets, the annual spending requirements of the overall portfolio, the bond-equity mix among public market investments, the diversification within the private markets portfolio, and the age of the program. The program's age is relevant because newer private markets programs have a high ratio of committed capital versus cash flow.

We define the danger zone (coral) as a probability above 5% that the overall portfolio would have less than two years of spending needs in public market assets. The caution zone (yellow) shows where some, but not all, combinations of the liquid asset mix and private market breadth are above the 5% threshold. Only investors with high spending needs (8% of the portfolio or higher per year) would have ended up with potential allocations below 20%. This suggests that the ceiling for private market allocations may be higher than is often assumed.

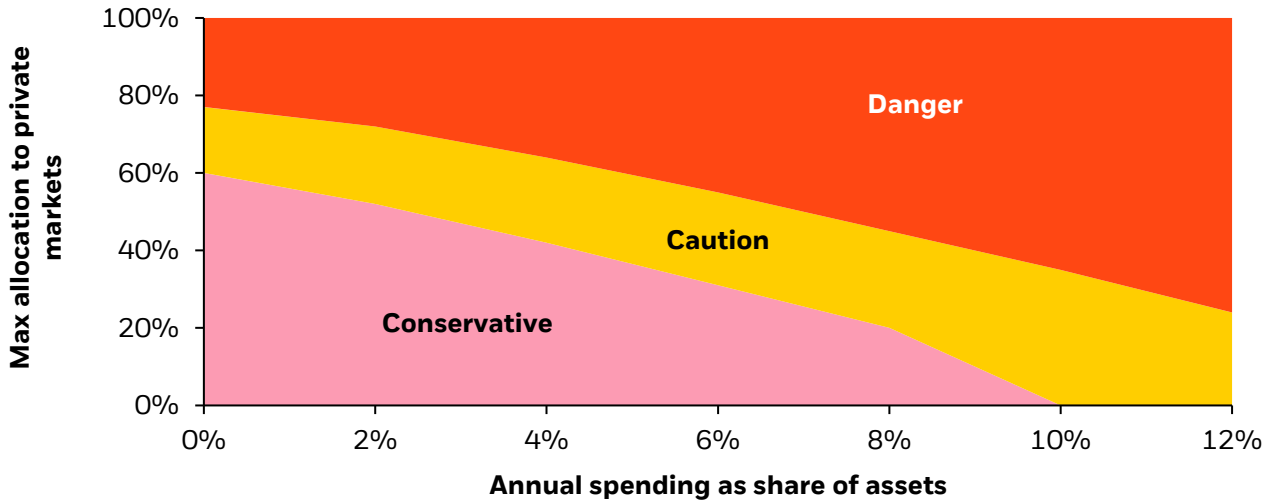
The big picture

Innovation in product structuring allows for semi-liquid portfolios which combine private markets with a limited liquid allocation and provide an additional layer of liquidity. When managing these portfolios our approach to liquidity focuses on two main objectives. First, we want to ensure sufficient capital to meet the needs of both the illiquid investments, as well as investor redemptions. Second, we try to minimize the impact of liquid exposure on performance.

Doing this well requires a whole-portfolio approach. It starts with the liquid segment of the portfolio, which should evolve over time to deliver alpha and meet the liquidity needs of a portfolio. For example, during the initial deployment into private markets, the portfolio will have higher cash needs. Once the portfolio reaches a steady state, it will start to see organic liquidity generated by the private portfolio, which in turn provides more flexibility for the liquid strategy to allocate to return-generating assets.

Assessing liquidity risks

Simulations help us determine the optimal and maximum allocations to private markets based on an investor's spending needs.



Source: BlackRock Investment Institute. Notes: The chart shows different ranges for maximum allocations to private markets assets depending on a hypothetical portfolio's annual spending needs, expressed as a share of the overall portfolio. The "Conservative" zone shows the range of maximum allocations can start at 60% with no spending needs and falls to zero when spending needs reach 10% per year. The "Caution" zone shows where maximum allocations would start hitting a 5% risk threshold described above. "Danger" is the zone where the maximum allocations result in a greater than 5% probability. We assume quarterly liquidity needs on the public assets. Annual liquidity needs would reduce the allocation to private markets. See appendix for full methodology. **This information if not intended as a recommendation to invest in any particular asset class or strategy or as a promise – or even estimate of future performance.**

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Inside the toolkit

These are some of the ways that specific private asset classes can help investors achieve their goals.

Source: BlackRock, Alternative Portfolio Solutions, February 2024. For illustrative purposes only.

Building better portfolios

A new market regime calls for a more widely diversified and dynamic investment approach, one that goes beyond stocks and bonds, and can take full advantage of the alpha-generating opportunities found in private markets.

Designing private markets portfolios and deploying the right technology to manage them takes a lot of work.

Typically, only the largest investors have the resources to directly construct and monitor diversified private markets portfolios. So, for investors interested in what private markets have to offer, it is important to ensure that all considerations in implementing a private markets portfolio are taken into account.

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Envisioning a private markets portfolio

A diversified, multi-strategy approach to private markets is key to creating an optimal risk-adjusted portfolio. This kind of allocation can mitigate idiosyncratic risk, generate a long-term, sustained premium to public equities in terms of both growth and income.

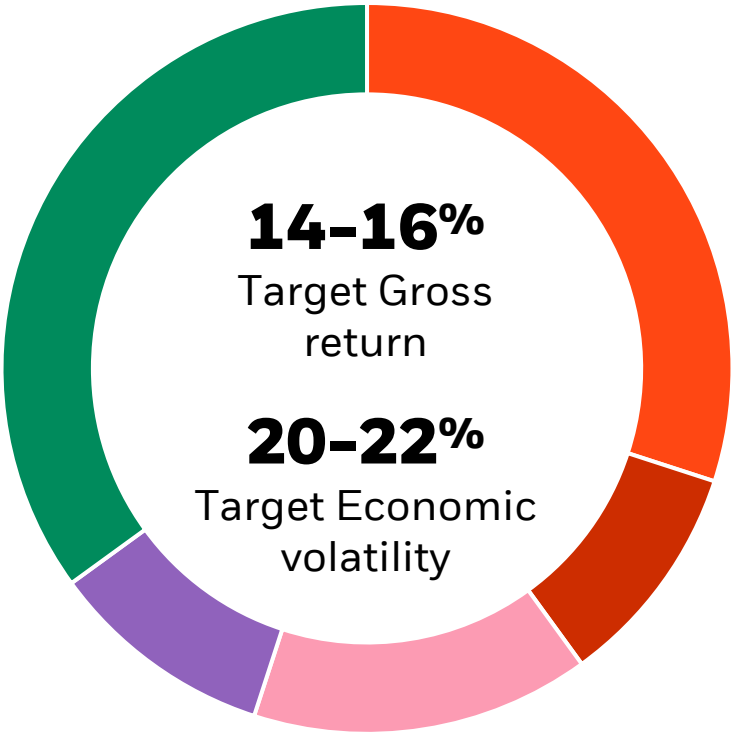
Here's a look at the investments a hypothetical allocation might include.

35%

Real Assets

Infrastructure equity
Investment in a U.S.-based producer of renewable natural gas from organic waste

Real estate
Ownership of a modern logistics facility in one of Sweden's transport hubs



30%

Private equity – buyout
A buyout of a leading provider of healthcare staffing solutions across the U.S.

10%

Private equity – growth
Investment in a leading radiotherapy company in Europe

10%

Opportunistic
Credit note backed by a diversified portfolio of loans originated by a global bank

15%

Direct lending
Loan to a leading French radiology platform

Source: BlackRock as of August 2024. For illustrative purposes only. Risks are calculated in collaboration with Aladdin and BlackRock's Risk & Quantitative Analysis team. Return assumptions from the public markets assets are derived from BlackRock's Capital Market Assumptions (CMA's) and private market assets are derived from BlackRock estimates and targets for each underlying strategy. The value of an investment can fall as well as rise and investors may not get back the original amount invested. There is a risk that the entire amount invested may be lost. Past performance is not a reliable indicator of current or future results. BlackRock makes no representations or warranties as to the accuracy or completeness of any past, estimated or simulated performance results contained herein, and further nothing contained herein shall be relied upon as a promise by, or representation by BlackRock whether as to past or future performance results. **This information if not intended as a recommendation to invest in any particular asset class or strategy or as a promise – or even estimate of future performance**

Appendix and references

Deriving hypothetical upper bounds for private market allocations

Input	Range Tested
Target allocation to private markets	0% to 100% of the total portfolio in June 2007
Annual liquidity/spending requirement from total portfolio	0% to 12% of June 2007 total portfolio value
Mix of liquid assets	100% global equity (MSCI ACWI) to 100% US investment grade fixed income (BB US Aggregate)
Number of private market fund commitments per year	4 to 20 funds per year
Age of private markets portfolio	1 to 20 years, although the output is conservatively based on the age with the greatest liquidity requirements during the global financial crisis
Quarterly NAVs and cash flows for private market funds	All fund types and geographies from Preqin

For each combination of the input parameters in the table above, we run 200 Monte Carlo simulations of portfolio performance from June 2007 to December 2012, each time selecting a random combination of private market funds to allocate to. The probability that the liquid assets fall below two years of spending requirements is recorded and used to produce the chart on page 4.

The conservative zone on the chart represents the range of allocations to private markets that don't result in greater than a 5% chance of a liquidity event for any combination of the other input parameters. The danger zone is the opposite extreme, where all combinations of input parameters lead to at least a 5% chance of a liquidity event. The caution zone is the middle ground, where an investors ability to tolerate liquidity risk depends on how conservatively or aggressively they allocate their portfolio.

We ran the analysis on the entire Preqin private market fund universe of about 3,500 funds.

BlackRock's Capital Market Assumptions disclosures

BlackRock's Capital Market Assumptions Disclosures: This information is not intended as a recommendation to invest in any particular asset class or strategy or product or as a promise of future performance. Note that these asset class assumptions are passive, and do not consider the impact of active management. All estimates in this document are in EUR terms unless noted otherwise. Given the complex risk-reward trade-offs involved, we advise clients to rely on their own judgment as well as quantitative optimisation approaches in setting strategic allocations to all the asset classes and strategies. References to future returns are not promises or even estimates of actual returns a client Portfolio may achieve. Assumptions, opinions and estimates are provided for illustrative purposes only. They should not be relied upon as recommendations to buy or sell securities. Forecasts of financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. We believe the information provided here is reliable, but do not warrant its accuracy or completeness. If the reader chooses to rely on the information, it is at its own risk. This material has been prepared for information purposes only and is not intended to provide, and should not be relied on for, accounting, legal, or tax advice. The outputs of the assumptions are provided for illustration purposes only and are subject to significant limitations. "Expected" return estimates are subject to uncertainty and error. Expected returns for each asset class can be conditional on economic scenarios; in the event a particular scenario comes to pass, actual returns could be significantly higher or lower than forecasted. Because of the inherent limitations of all models, potential investors should not rely exclusively on the model when making an investment decision. The model cannot account for the impact that economic, market, and other factors may have on the implementation and ongoing management of an actual investment Portfolio. Unlike actual Portfolio outcomes, the model outcomes do not reflect actual trading, liquidity constraints, fees, expenses, taxes and other factors that could impact future returns. Asset allocation/diversification does not guarantee investment returns and does not eliminate the risk of loss.

Index Disclosures: Index returns are for illustrative purposes only and do not represent any actual fund performance. Index performance returns do not reflect any management fees, transaction costs or expenses. Indices are unmanaged and one cannot invest directly in an index.

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Capital Market Assumptions methodology

Interest Rates: Our model provides a way to chart the yield curve at multiple time horizons in the future. We base this on our estimates of: (1) the short rate and (2) model implied term premia. We base our estimates of short rates on market data in the near term and on macro-informed data in the long term. We assume investors' views about long run inflation and real growth, coupled with changing preferences as to savings and risk aversion, will ultimately determine their expectations for short rates (the "long run short rate"). We use an affine term structure model -a type of model that assumes bond yields as a linear function of a small set of parameters (Piazzesi, 2010) –to compute model-implied term premia. In our implementation, we represent the yield curve using the first five principal components of yield, as laid out by Adrian et al. (2013). We then blend the model implied term premia from the affine term structure model with market implied term premia, with the relative weights dependent on the relevant time horizon.

Equities: Expectations of cash flows and discount rates can help explain the variability in equity returns as shown by Campbell (1990). We have used this insight to develop a discounted cash flow (DCF) model, with a few key innovative features. Most academic research focuses on the question of whether stock returns are predictable at all. We are concerned with making the best estimates that we can. We make two additional contributions. First, the baseline DCF model estimates earnings by leveraging analyst earnings estimates in the near term as discussed by Li et al (2013) to derive the implied cost of capital. The common assumption in implied cost of capital (ICC) studies is that earnings growth implied by analyst earnings estimates in the near term should trend towards GDP growth in the long term. This can introduce an unintended assumption of continued expansion of profit margins. We have introduced a modification to account for late economic cycle dynamics. We allow for corporate profit margins to revert to trend (the median over a rolling 10-year history) as margins typically peak late-cycle. The standard ICC approach typically tests for equity returns using linear regression tests. For our DCF model, we take the desired time horizon as an input (number of years) and we estimate the appropriate discount rate for the specific time horizon using our aggregate implied cost of capital. This way, we account for both key sources of variability in equity returns, namely changes in cash flows and changes in the discount rate.

Credit: Our model for credit asset (excess) returns is anchored on two key elements: 1) our estimate of credit spread at a given horizon and 2) our estimated loss due to defaults and downgrades over the horizon. The first component is projected in a consistent manner with our view of real GDP growth and the link between credit spreads and equity volatility. Our approach helps explain the behaviour of credit spreads using a limited number of predictive variables. Yet, as validated by tests against more complex methods, it retains the ability to help explain a high proportion of the variance in credit spreads. The second component is estimated based on our outlook for spreads, the duration of the asset and an assumed transition matrix which captures migrations and defaults across multiple credit cycles. We currently base our transition matrix on Moody's long-run transition data. We aim to further develop our model by directly modelling transitions based on macroeconomic conditions in order to better capture cycle dynamics and the respective variation in losses due to credit events. In addition to making our estimates of credit spreads consistent with our macroeconomic views, our new credit (excess) return model allows greater flexibility of calibrating our expected returns to different credit rating compositions which may prevail over the entire time horizon.

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Capital Market Assumptions methodology

Uncertainty and optimisation: Expected returns and asset price volatility are difficult to predict. We believe any technique that builds Portfolios should incorporate this inherent uncertainty (Ceria et al. 2006). We consider both long-and short-term drivers of return. In the long run, we expect a relatively small number of macroeconomic drivers —economic growth, rates, inflation, credit and currencies —to determine an asset's returns. In the short-run, other factors can overpower the structural drivers causing wider fluctuations from an asset's fair value. Valuations can be helpful in estimating short-term returns. We combine contributions from the long-and short-term return drivers to produce a final set of return expectations with a range of uncertainty around each.

The next step is to use this set of return expectations in an optimisation engine that seeks out the best return without breaching an investors' risk limit. Mean variance optimisation would produce a Portfolio that maximises expected return under one base scenario with a given level of risk. In contrast, we look to build a "least-worst" Portfolio –one that maximises returns for an investors' target risk levels across the worst outcomes, say for the bottom 50% of the distribution, from a set of stochastically generated scenarios (cf. Tütüncü et al. 2004 and Garlappi et al. 2006). This helps ensure the Portfolio is not overly reliant on just the median return. This process seeks to produce a Portfolio that is robust to small changes in the central return estimates (Scherer, 2006).

Stochastic engine: We use Monte Carlo simulation to create random distributions informed by historical return distributions and centred on our expected returns. The engine simulates thousands of return pathways for each asset, representing the range of possible outcomes over a five-to 20-year time horizon. We leverage BlackRock's risk models to help ensure that assets generate similar returns, to the extent that they have common drivers . The range of scenarios incorporate our work on incorporating uncertainty in return expectations. We use an extension of the Black-Litterman model (1990) –a well-known model for Portfolio allocation that combines equilibrium returns and medium-term views in a single-period setting. Our model uses a Kalman filter (1960) –an algorithm that extracts insights about return paths by bringing together a number of uncertain inputs -to extend Black-Litterman into a multi-period setting. This allows us to capture the variation of expected returns over time under various scenarios —from economy-related to market sentiment driven. A large part of these variations is not predictable. Constructing Portfolios that are robust to, or can exploit, these variations is a major challenge for investors. The ability to calibrate the engine with asset class views with uncertainty at arbitrary time horizons, and to evolve this uncertainty stochastically, drives the dispersion of return outcomes. Highlighting the uncertainty that investors face when building Portfolios helps ensure ostensibly precise return expectations do not lead investors to concentrated Portfolios.

Simulated return paths support a broader range of applications, such as asset-liability modelling. We believe stochastically generated return scenarios enable investors to move with ease beyond mean-variance and optimise Portfolios against their individual needs. Investors can place more emphasis on the tails of the distribution or focus on the path of returns rather than just the total return. They can incorporate flows in or out of the Portfolio over the course of the investor's time horizon or place more emphasis on scenarios that are challenging for the investor's business beyond their Portfolio. Investors with complex asset-liability matching requirements, such as insurers, typically rely on stochastic simulations of returns to assess and construct Portfolios.

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