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# A better way to build private market portfolios

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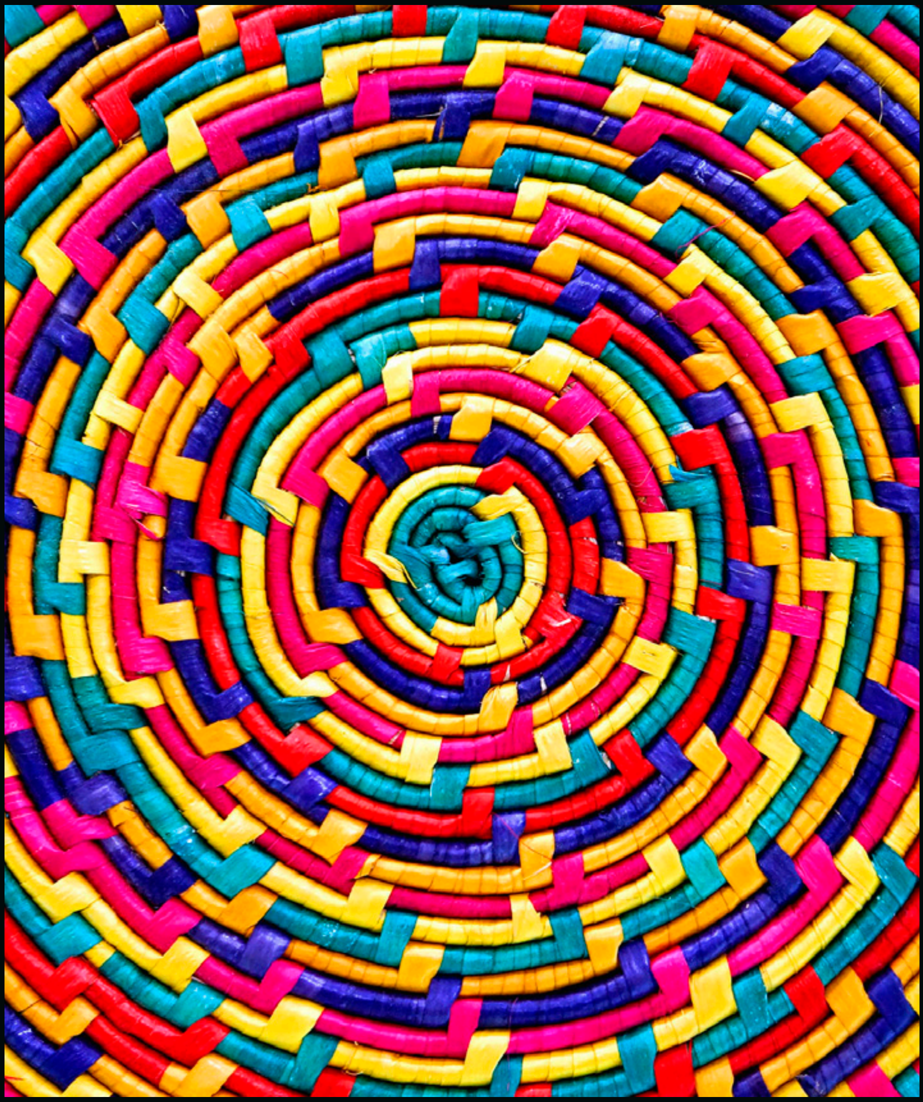


ALTH0221U/M-1446949-1/16

# Contents

**Summary** 3

**Current limitations** 4

**Potential benefits of a new approach** 5

**Our approach** 6

- Forecasting 6
- Optimization 7
- Cash flow simulation 9

**Assessing performance in our framework** 9

**Areas for further inquiry** 10

**Conclusion** 10

**Pam Chan**
Chief Investment Officer and Global Head of the Alternative Solutions Group

**Stephen Boyd, Ph.D.**
Senior advisor for the BlackRock AI Labs / Professor and Chair of the Electrical Engineering Department at Stanford University

**Mykel Kochenderfer, Ph.D.**
Senior advisor for the BlackRock AI Labs / Professor of Aeronautics and Astronautics at Stanford University

**Vidy Vairavamurthy**
Co-Head of Research of the Alternative Solutions Group

**Brandon Levy**
Co-Head of Research of the Alternative Solutions Group

**Jonathan Callan**
Director, Alternative Solutions Group

**Pascal Nguyen**
Vice President, Alternative Solutions Group

**Raphael Benarrosh**
Vice President, BlackRock AI Labs



ALTH0221U/M-1446949-2/16

# Summary


- When allocations to private markets were smaller, building portfolios using rules of thumb and traditional optimization techniques was acceptable, if not ideal.

- Today, larger and more diverse allocations require an approach that can meet the private market challenges of illiquidity, extreme dispersion of returns, scarce data and barriers to maintaining allocations at desired levels.

- We have developed a framework that addresses these complexities through a three-step process:

1. We **forecast** a distribution of performance for possible investment opportunities across time and asset classes.

2. We use the forecasted risk/return distribution across opportunities to **optimize** a series of possible portfolio allocations as a function of a risk aversion parameter.

3. We **simulate** a series of plausible cash flow curves for each opportunity whose returns are consistent with those forecasted in the first step and aggregate them into portfolio-level cash flows for each of our optimized portfolios.

- We believe our approach brings enhanced quantitative portfolio construction techniques to private markets.

# Current limitations

Private market asset classes play an increasingly important role in institutional portfolios.

With their potential to enhance returns and help mitigate risk through diversification, private markets have become mainstream investments. Along with the growth in capital, there has been growth in the breadth of asset classes. Infrastructure and private credit have joined private equity and real estate as "core" alternatives; opportunities in more specialized sectors such as agriculture, aviation finance, digital infrastructure and music royalties have expanded as well.

Due to their breadth and depth, the private markets can no longer be treated as a monolithic asset class by capital allocators. Furthermore, as private investments continue to become larger portions of portfolios, the effects of extreme economic and market volatility (e.g., the COVID-19 economic shutdown) will bring new challenges to managing illiquid holdings and will present new opportunities that require a more holistic approach to portfolio construction and risk management. As investors increase the size and scope of their private market portfolios, utilizing robust models and frameworks to manage and analyze these portfolios becomes more important.

The current understanding of how to optimally include private market assets in an investment portfolio is limited. Ideally, investors would have access to a framework that could ensure they are maximizing their desired benefits. As allocations to private markets have increased, many investors have struggled to develop portfolio construction methodologies that account for the unique aspects of private market investing. Some have ignored quantitative portfolio construction altogether, opting for a more qualitative approach, while others have attempted to use standard quantitative methods developed for liquid investments. Among other issues, standard quantitative methods are weakened by the fact that they utilize metrics (e.g., internal rate of return) that fail to fully capture the behavior of private market investments; cash flows provide a far more complete depiction.

Applying these traditional methods to private markets can be difficult because many of the assumptions that underpin portfolio construction processes designed for public assets do not hold for private market asset classes. Specifically, we see four fundamental discrepancies between public and private asset classes that are relevant for portfolio construction:

### Illiquidity

Positions cannot be quickly and reliably sold; secondary market transactions can result in substantial costs.

### Opaque valuations

Due to the relative illiquidity of the market, opportunities to observe mark-to-market valuations occur infrequently and irregularly. Many public market risk and portfolio optimization models require that updated valuations be available on a frequent, regular cadence (often daily) in order to estimate the required parameters for each asset. Investments generally exhibit low accounting-based return volatility and correlations to public markets, but higher economic risk and market correlations when valuations are marked to market.

### Paucity of data

Access to data is limited. It is generally difficult to obtain data on private market transactions. Quarterly fund-level cash flow and net asset value (NAV) information is often all that is available.

### Implementation

Traditional frameworks optimize for target allocations and assume they can be implemented quickly. In private markets, translating target allocations into actual exposures is likely to take time, to be inexact and to need regular revision as investments realize.

The aim of this paper is to provide a comprehensive framework to address portfolio optimization for private market assets.

# Potential benefits of a new approach

The growth of private markets owes much to the twin catalysts of low rates and regulatory restraints on banks. The former launched a global hunt for yield, while the latter left a financing void in several sectors. There are also longer-term trends at work. The history of investing, and especially of institutional investing, shows an ongoing quest for new frontiers. Public markets, though vast, serve only a portion of the globe's financing needs; it was inevitable that institutions would look beyond them. As private markets expand and debt and equity exposures within them multiply, they come to resemble public markets in offering an array of investments that can target not only capital growth, but also a full range of outcomes.

As occurs in the public markets, private market asset classes have varied in performance over time and have exhibited fluctuations in their relative attractiveness (see the table below). This dynamic creates a compelling opportunity to improve portfolio outcomes with active portfolio allocation decisions. A key activity for any investor is holistically managing his or her portfolio across the various private market strategies. Establishing the appropriate framework to determine the right strategic asset allocation enables investors to combine portfolio outcomes, risk tolerances and client constraints in a cohesive and structured process.

The current practice for portfolio construction stems from a seminal paper in 1952 by Harry Markowitz, where he emphasized the importance of diversification and posited that risk-averse investors can construct portfolios to maximize their expected return based on the level of market risk they wish to assume. This framework utilizes expected return, volatility and correlation of individual asset classes as inputs to compute a continuum of portfolio return and risk choices. One important requirement of this framework is that portfolios can be rebalanced to target outcomes, even after large market drawdowns. Moreover, a key benefit of diversification is the ability to rebalance from the performing assets to the underperforming assets and benefit from the reversion back to long-run return expectations.

The illiquid nature of private market asset classes creates an additional portfolio consideration, alongside market risk, as rebalancing illiquid assets is often not feasible. This limitation is most obvious in moments of extreme market stress such as the 2008 Global Financial Crisis and the 2020 COVID-19 shutdown. These episodes of market turbulence have underscored the value of thoughtful portfolio construction in safeguarding desired portfolio outcomes. The importance of understanding market factors within private exposures and the benefits of truly idiosyncratic and diversifying sources of return have become even clearer. Designing a portfolio with private market assets requires the understanding of several additional attributes that investors need to incorporate into their portfolio modeling if they are to better comprehend both their risks and their opportunities to positively affect risk-adjusted return.

**Broad scope for active allocation**

Asset class net IRR rankings by vintage

| Rank | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 2000 | 21.1% - Infrastructure | 19.0% - Real Estate | 18.5% - Private Equity | 13.7% - Private Credit |
| 2001 | 24.6% - Infrastructure | 22.8% - Private Equity | 18.8% - Real Estate | 13.1% - Private Credit |
| 2002 | 40.0% - Infrastructure | 20.2% - Private Equity | 20.2% - Private Credit | 13.8% - Real Estate |
| 2003 | 23.0% - Infrastructure | 13.8% - Private Equity | 12.0% - Real Estate | 7.3% - Private Credit |
| 2004 | 11.6% - Infrastructure | 10.9% - Private Equity | 8.0% - Real Estate | 7.4% - Private Credit |
| 2005 | 8.1% - Private Equity | 7.2% - Private Credit | 2.8% - Infrastructure | 0.4% - Real Estate |
| 2006 | 8.9% - Private Credit | 8.1% - Private Equity | 4.7% - Infrastructure | 0.2% - Real Estate |
| 2007 | 10.1% - Private Equity | 8.4% - Private Credit | 3.4% - Infrastructure | 3.3% - Real Estate |
| 2008 | 11.7% - Private Credit | 10.8% - Private Equity | 5.2% - Real Estate | 2.6% - Infrastructure |
| 2009 | 14.9% - Private Equity | 11.0% - Private Credit | 11.2% - Real Estate | 4.4% - Infrastructure |
| 2010 | 12.8% - Real Estate | 13.9% - Private Equity | 10.5% - Private Credit | 3.5% - Infrastructure |
| 2011 | 12.7% - Private Equity | 12.0% - Real Estate | 7.7% - Private Credit | -4.2% - Infrastructure |
| 2012 | 13.9% - Private Equity | 11.3% - Real Estate | 8.2% - Private Credit | 6.2% - Infrastructure |

Source: Thomson Reuters, December 2020. This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise — or even an estimate — of future performance. Past performance is not indicative of future results.

# Our approach

To build a coherent framework for private market portfolio optimization, we need to address the four challenges that stymie traditional approaches: illiquidity, opaque valuations, paucity of data and implementation.

Unlike traditional marketable securities, private asset classes typically require specialized modeling techniques and carefully curated data. Importantly, any quantitative approach to modeling should be tempered by the judgment of an experienced private market investor. One approach is to use what we call the “Alternatives Turing Test.”[1] In such a test, an experienced investor who is knowledgeable in private markets helps determine the validity of cash flows generated from our model. This “quantamental” approach suggests that blending sound judgment and robust analytical methods leads to better portfolio construction decisions. Establishing the right framework now will ensure benefits to investors in the long run as these markets mature and the accumulation of data accelerates (which will have a substantial impact given the current limitations on data availability).

Our approach to private markets portfolio optimization involves three distinct steps:

1. We **forecast** distributions around the performance of all possible investment opportunities across time and asset classes.
2. We use the forecasted risk and return distributions across opportunities to **optimize** a series of possible portfolio allocations as a function of a risk aversion parameter.
3. We **simulate** a series of plausible cash flow curves for each opportunity whose returns are consistent with those forecasted in the first step and aggregate them into portfolio-level cash flows for each of our optimized portfolios.

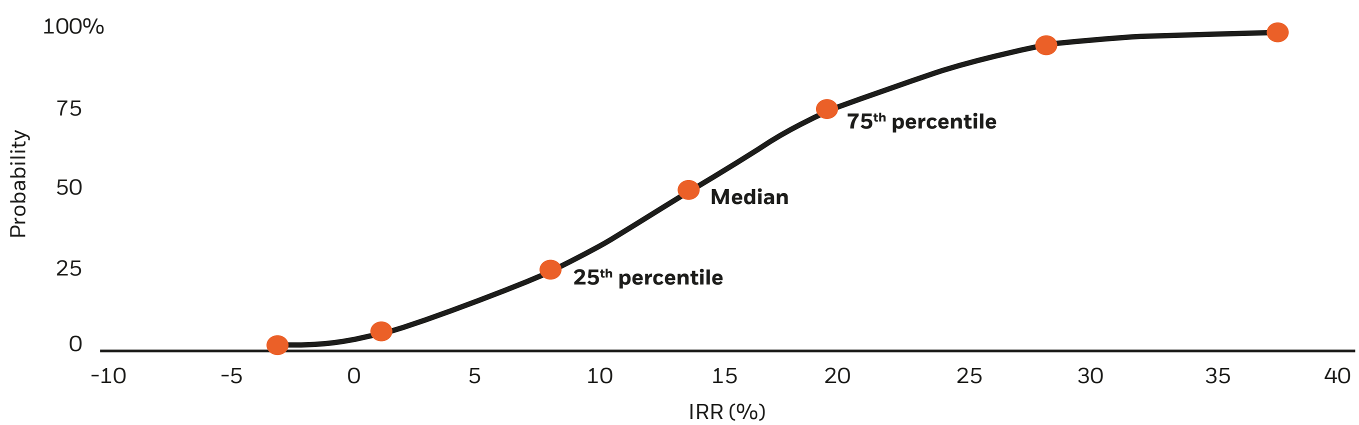
## Step 1: Forecasting

Return forecasting has been well studied because it is a key input for asset allocation decisions. However, creating returns models for private assets presents additional difficulties because of two issues:

1. Valuations are only observed during discrete liquidity events occurring at unpredictable and irregular intervals, in contrast to public assets whose valuations and returns may be observed regularly and frequently.
2. Private markets data is sparse and inconsistent, even when investment returns are theoretically observable.

**Figure 1: Forecasting a distribution of possible returns**

U.S. Buyout - Cumulative Distribution Function*




* For each IRR value on the horizontal axis, the Cumulative Distribution Function indicates the probability forecasted returns will be equal or below that value. On this illustrative figure, there is a 50% probability return will be lower than 13%. Source: BlackRock, December 2020. This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise – or even an estimate – of future performance.

1 The Turing Test, originally called the imitation game by Alan Turing in 1950, is a test of a machine’s ability to exhibit intelligent behavior equivalent to, or indistinguishable from, that of a human.

Our approach is to quantify the performance of the fund using a single state variable derived from the observable fund quantities: contributions, distributions, and net asset values. We then analyze the evolution of this variable for historical funds to answer questions around the expected future performance of new or existing investments given the investments and economy's observed performance to date.

While public markets investors are accustomed to using vast quantities of indicators to attempt to forecast a security's return, such methods require a commensurate amount of security return data to avoid creating models that overfit the data. Due to the relatively small quantity of data available in the private markets, we limit ourselves to a curated set of indicators for each asset class based on fundamental linkages (e.g., interest rates for real estate, equity multiples for buyout, etc.).

Figure 1 illustrates the results of the forecasting process for U.S. Private Equity Buyout funds, depicting the range of potential IRRs and the associated cumulative probabilities.

## Step 2: Optimization

We utilize an expected utility framework for our portfolio optimization methodology, which provides a coherent approach for constructing portfolios that systematically weighs the risk/reward trade-off and correlations across asset classes. This framework also provides a facility for expressing an investor's risk tolerance via a risk aversion parameter. Figure 2 depicts the different strategic asset allocations as a function of our risk aversion parameter.

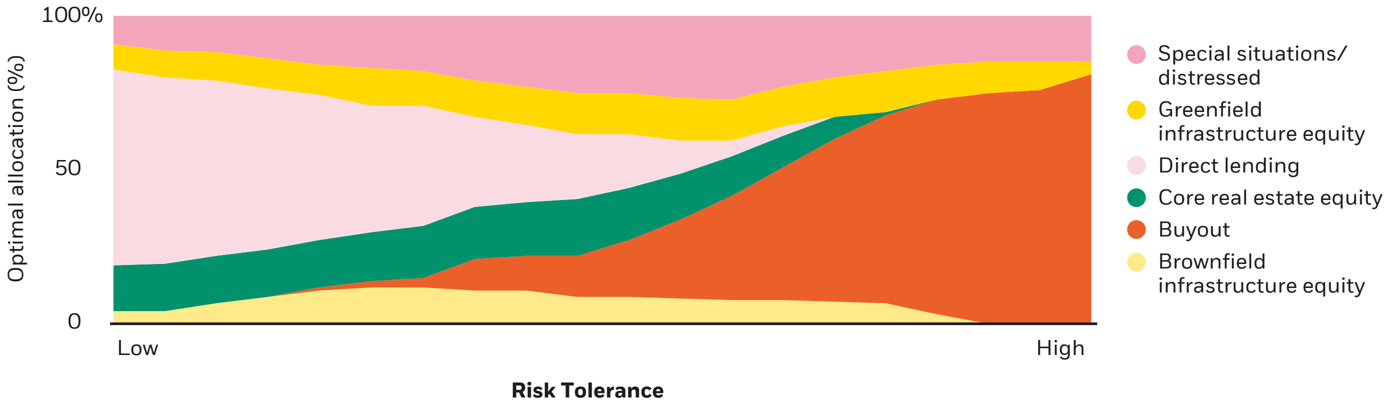
The results we obtain for different values of risk aversion are consistent with our intuition. With high risk aversion, the constructed portfolio is mostly direct lending; for low risk aversion, the constructed portfolio concentrates in a few, riskier asset classes with the resulting allocation having a high probability of clearing a more aggressive target rate of return. The interesting and useful portfolios are found in between these two extremes. The exact portfolio that is ultimately chosen will differ depending on a given investor's goals, investment constraints and risk appetite. Specifically, we can choose among the proposed portfolios based on our core metrics: probability of clearing the target rate and probability of avoiding an undiscounted loss. We can also evaluate a variety of other metrics and use them to help choose the right level of risk aversion.

While the optimization results provide a good starting point, they include several core assumptions that fail in the context of private markets investing. The most important of which are:

1. The optimization assumes that the portfolio may be rebalanced regularly to maintain target exposures as asset valuations evolve.
2. The optimization assumes that a target allocation may be achieved nearly instantaneously given a sufficient buffer for transaction costs.

While these assumptions may be perfectly reasonable for portfolios of public securities, they are not suitable for private markets. While the concept of secondary market transactions certainly exists in private markets, secondary market transactions for the purposes of portfolio management are still cumbersome relative to routine portfolio rebalancing processes in public markets. Investing in private investments also takes dramatically longer due to the time required to source and execute transactions. These nuances deserve consideration in a robust private markets portfolio optimization framework.

**Figure 2: Optimizing the portfolio across a range of risk tolerance levels**



Taking the above considerations into account, our optimizer uses a technique called model predictive control (MPC) that generates not only a target allocation, but also an explicit investment plan for each quarter spanning the fund's entire investment period. This plan is created using available information from a variety of sources at the time of its generation, including expected investment level risk and return distributions, the macroeconomic environment and projected deal availability. Figure 3 depicts a sample investment plan for a relatively conservative portfolio.

As our investors execute the plan, it is normal and expected that the actual investments made will deviate somewhat from the plan generated by our optimizer due to market realities such as constraints around deal sourcing and availability. Regardless, the optimizer intelligently adapts the remainder of the plan to the performance of the fund's existing investments and to changing market conditions to maintain the target risk level.

Figures 4 & 5 below depict this process in action. Figure 4 depicts the initial plan for a capital growth portfolio allocation. Figure 5 depicts how the plan has evolved after the first four quarters of investments have been made; specifically, bars after period 4 represent planned investments, whereas the bars from period 1 to 4 represent completed investments.

By creating a planned series of investments to be made during each quarter of the investment period, our approach explicitly accounts for the fact that a target allocation cannot be reached immediately, as is the case when investing in public securities. This approach allows us to be systematic and rigorous in the deployment of capital while working towards a target allocation. Our framework also works within the constraints of the immutability of investments that have already been made when recommending future investments, rather than assuming that the portfolio may be rebalanced to achieve a target allocation.

**Figure 3: A sample investment plan implementing a relatively conservative portfolio**

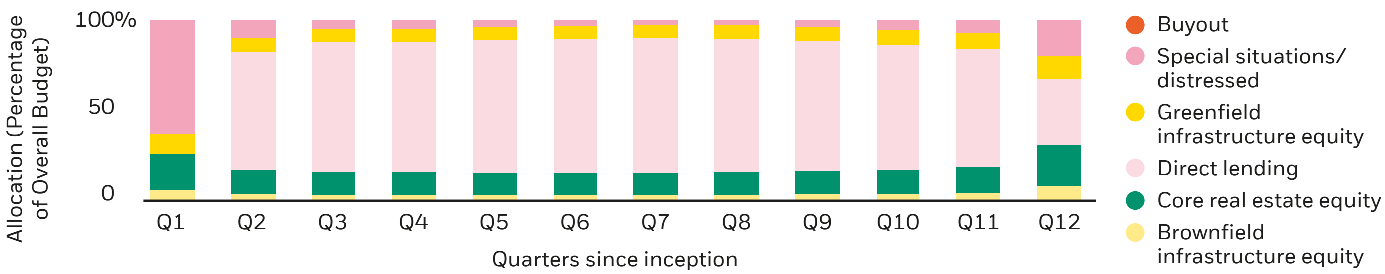



**Figure 4: Capital growth portfolio capital commitment schedule at inception**

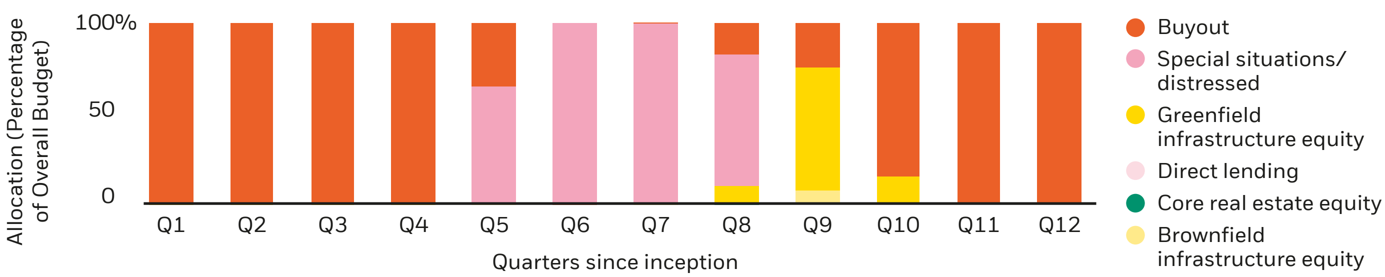
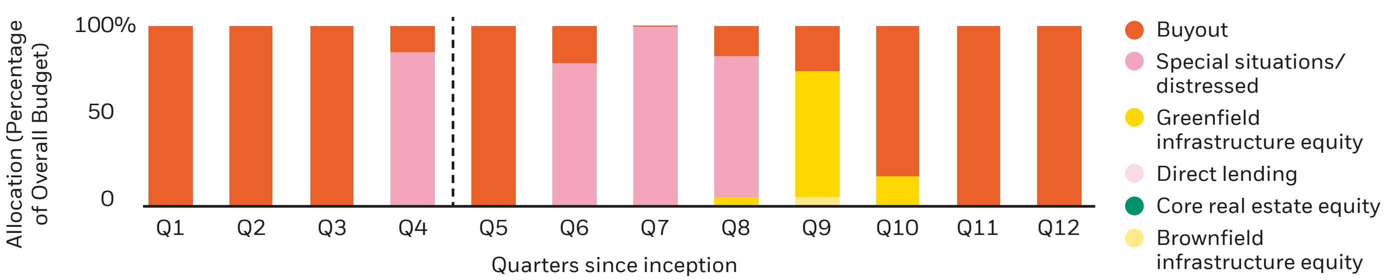



**Figure 5: Capital growth investment plan one year into the investment period of the fund**




Source: BlackRock, December 2020. This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise – or even an estimate – of future performance.

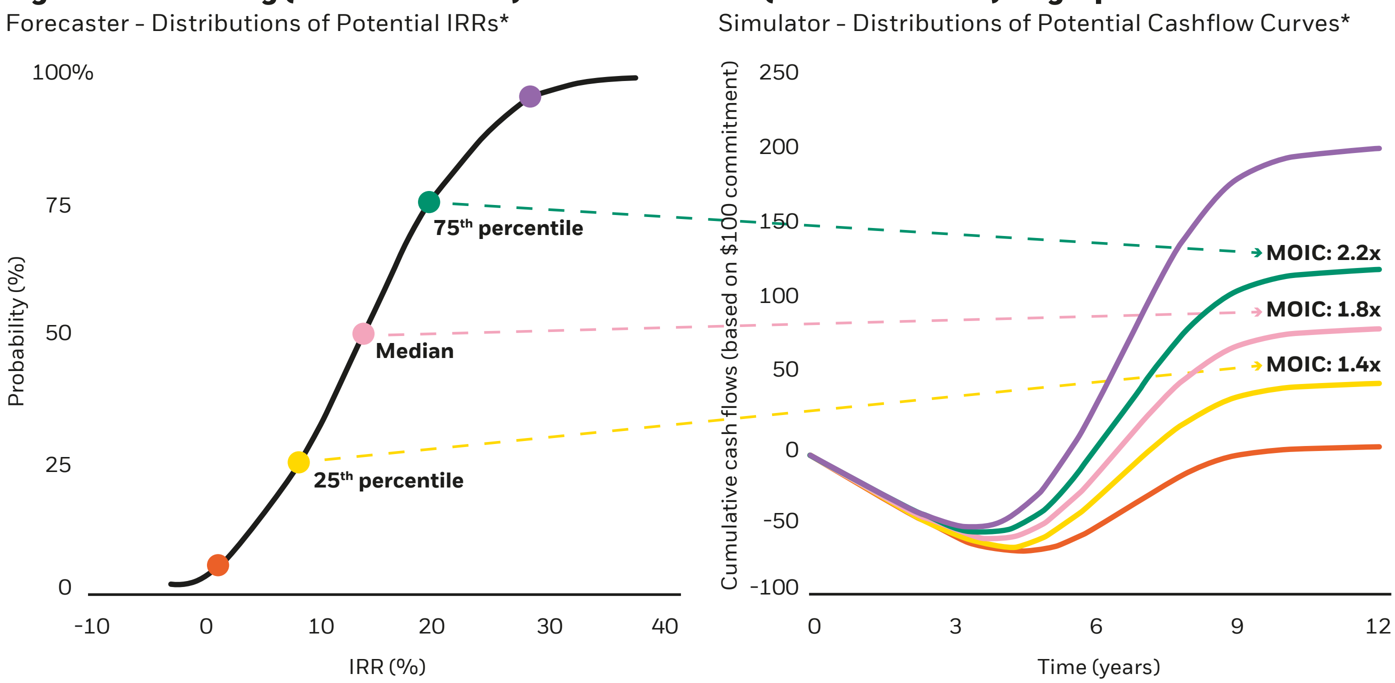
## Step 3: Cash flow simulation

Once we have forecasted the distribution of possible returns for each asset class and generated the series of planned investments at the portfolio level, we generate cash flow curves for the individual assets. These cash flow curves are then aggregated using the portfolio allocations that were created in the previous step into portfolio-level cash flow curves, which may be analyzed with respect to different investment metrics such as IRR, NPV, and MOIC.[2]

The simulation takes the following characteristics of private market cash flow profiles into account:

1. Cash flow profiles involve modeling both the timing and the size of cash flows.
2. As cash flows are not independent of those that precede them, cash flow series contain significant auto-/cross-correlations.
3. Cash flows should be consistent with investor experience.

**Figure 6: Simulating (a distribution of) cash curves from (a distribution of) single point estimate returns**




***** Each IRR point estimate across the distribution generated by the Forecaster is developed into a cash flow curve.
Source: BlackRock, December 2020. This information is not intended as a recommendation to invest in any particular asset class or strategy or as a promise – or even an estimate – of future performance.

## Assessing performance in our framework

Our simulated cash flows allow us to derive distributions of common investment metrics needed when making investment decisions. We can, for example, ask what the range of expected IRR's for a given risk appetite is, or what the probability of an undiscounted loss of greater than 10% is, again for different levels of risk tolerance. Our process uses the following statistics to review each portfolio suggested by the optimizer:

**NPV relative to a given hurdle rate**
Assess value generation for each percentile on the spectrum of expected outcomes

Use case: Seek to maximize value generation in the median case

**Probability of achieving a target IRR**
Use case: Seek to maximize probability of clearing a hurdle that corresponds to servicing a set of liabilities

**Probability of avoiding an undiscounted loss**
Assess portfolio resilience

Use case: Prioritize protection of capital in order to construct a more defensive portfolio

**2** Private market cash flow modeling is an area of limited research; notable exceptions include Ang, Chen, Goeztmann and Phalippou (2018), Buchner (2017) and Robinson and Sensoy (2016).

## Areas for further inquiry

Our methodology can be extended to incorporate the following:

1. **Increased granularity:** Our current analysis focuses on primary fund commitments across eleven separate asset classes. Future analyses could include added granularity around region (e.g., North America, Europe, Asia Pacific), sector (e.g., information technology, telecommunication, healthcare), and implementation type (e.g., primary funds, secondary funds, direct investment). To be most useful, such analyses will require more granular and plentiful historical data.

2. **Scenario analysis:** Our current analysis focuses on portfolio optimization in a set of given circumstances. Future analyses could allow investors to understand the impact that a change in market conditions (e.g., rates rise 100 bps) would have on their optimal portfolio allocation.

3. **Combining with public or other investments within alternatives:** The framework can be readily extended to include portfolios that span alternatives and other asset classes.

# Conclusion

Many private alternatives investors do not optimize their portfolios with any consistent methodology. Markowitz optimization is widely used by investors creating portfolios of public assets with ample data. However, due to the four principal challenges outlined above, traditional methodologies do not translate well to private asset classes without modifications. Our improved portfolio optimization methodology, combined with careful development of a forecasting model and cash flow simulation, brings quantitative portfolio construction techniques to the private markets. We believe that this approach will result in better and more tailored outcomes for our clients.



ALTH0221U/M-1446949-10/16

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