

INSTITUTIONAL ADVISORY & SOLUTIONS

ASSET ALLOCATION WITH ILLIQUID PRIVATE ASSETS

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AUTHORS

Junying Shen

Associate, Institutional Advisory & Solutions Research
junying.shen@pgim.com
+1 973 367 8198

Bruce D. Phelps, CFA

Managing Director, Institutional Advisory & Solutions Research
bruce.phelps@pgim.com
+1 973 367 6661

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In an environment of low public market expected returns, the higher expected returns of some illiquid private assets look enticing despite the lack of reliable secondary markets – investors effectively must hold these illiquid assets until maturity.

The higher expected returns of many illiquid assets may help improve portfolio performance. However, a challenge for investors is to determine their allocation to illiquid assets subject to their cash flow obligations. Many investors are comfortable with the notion of segmenting their portfolios into a liquid component and an illiquid component. In fact, it is common for investors to define an “illiquid bucket” for the portion of their assets that will not be needed for liquidity purposes for many years. But, what is the optimal illiquid-liquid asset mix for a long-horizon investor?

We have developed an asset allocation framework to illustrate how a CIO might determine their allocation to illiquid assets, subject to how confident they wish to be regarding their cash flow constraints. This framework highlights how the illiquid-liquid allocation has consequences for the composition of the investor’s liquid public market portfolio as a less-risky liquid portfolio may allow the investor to increase allocation to the illiquid asset. This framework, which can be customized to incorporate investors’ own liquidity requirements, risk and return assumptions, and time horizon, might help CIOs and investment committees make more informed decisions with respect to their strategic investments in illiquid private assets.

Below, we present a brief overview of the model. A more detailed version of this paper describing the model is available.

Compared to liquid public assets, the characteristics of some illiquid assets offer a number of potential risks and rewards which may contribute to a “private market premium.” The expected return advantage of some illiquid private assets over liquid public assets should reflect compensation for any additional risk exposures and potential returns related to the characteristics of these illiquid private assets. These may include:

- (1) **Structural complexity.** An illiquid private asset can be structurally complex, where the underlying sources of cash flow can be hard to forecast. Investors in illiquid private assets are likely to demand compensation for complexity.
- (2) **Rebalancing opportunity cost.** Illiquid private assets may impose an opportunity cost on investors from foregone portfolio rebalancing opportunities for which investors would insist on better expected performance relative to liquid public assets.
- (3) **Uncertainty of liquidity needs.** Some investors may never be completely certain about their capacity to hold illiquid assets. For them, there is always some chance that they could suffer a liquidity shock that would require them to make other arrangements to raise cash which are generally undesirable. Investors would insist on compensation for this “uncertainty” risk from their illiquid investments.
- (4) **Privately negotiated terms.** Unlike liquid public assets, for some illiquid private assets there is negotiation between the private company and investor as to the asset’s terms and conditions. As such, there is greater scope for the investor to earn higher risk-adjusted returns from the investor’s private information, operational skill, negotiating power, and on-going oversight of the company.
- (5) **Systematic risks.** Over time, capital markets have rewarded investors for taking more risk. Public equity markets have an increasing scarcity of smaller, faster growing – but, potentially riskier – firms as new companies may have less need for fixed assets and can readily finance themselves using private markets. Illiquid private equity LP investments may offer higher expected returns – in return for higher risk – than is available in the public markets.
- (6) **Valuation stability.** Finally, some illiquid private assets offer investors an important advantage: relative stability of valuations for periodic reporting purposes. Given the potentially lower reported volatility of some illiquid private assets, an investor may be willing to accept lower expected returns relative to comparable-risk public assets.

Taken as a whole, it is reasonable to assume that illiquid assets would offer higher expected returns relative to public markets. Given this potential advantage, what is the optimal illiquid-liquid asset mix? We have developed an asset allocation framework to illustrate how an investor might determine their allocation to illiquid assets, subject to how confident they wish to be regarding their portfolio’s cash flow constraints. The asset allocation framework can be modified to fit many types of illiquid private assets and liquidity scenarios. A feature of our model is that we explicitly treat illiquid assets as illiquid – they cannot be sold until maturity. This differs from models which may lump illiquid and liquid assets together within a traditional, single-period asset allocation framework (e.g., mean-variance optimization) which assumes that the available assets are tradeable and portfolio holdings can be rebalanced.

A key risk the investor faces when allocating to illiquid assets is not having enough liquid assets that can be sold for sufficient net cash when needed. To explicitly recognize this risk, our model assumes the investor selects an asset allocation to maximize total portfolio value at a horizon date subject to the constraint that the value of the liquid assets over the horizon is sufficient to satisfy any interim cash flow requirements at a pre-specified level of confidence. So, the key tradeoff for investors is between their total portfolio value at the horizon date versus how confident they want to be able to satisfy their need for liquidity (i.e., available cash) up to the horizon date.

Our asset allocation framework addresses the following investor questions:

- **What is the optimal allocation between liquid and illiquid assets** based on the investor’s horizon return objective and liquidity requirements up to the horizon date?

- How does an investor's need for liquidity interact with the investor's objective of maximizing horizon wealth (i.e., returns)?
In other words, **what is the cost of the investor's liquidity constraint?**
- How much might portfolio expected returns decrease if an investor wishes to be more confident meeting interim cash flow requirements (e.g., 90% certain rather than 80% certain)? In other words, **what is the marginal cost of increased liquidation certainty?**
- How does the illiquid-liquid asset allocation decision affect the **allocation within the liquid asset portfolio?**
- **How do other factors** (e.g., the investor's horizon, the magnitude of any illiquid asset return advantage over liquid assets, and the sensitivity of liquidation requirements to the economy) **impact the allocation results?**

Our model framework is as follows: There are three assets: one illiquid asset, and two liquid assets. Of the two liquid assets, one is a "liquid low-risk" asset and the other is a "liquid high-risk" asset. For this particular example, we assume that the "illiquid asset", which is not tradeable before the horizon date, has both higher risk and a greater expected return compared to the liquid high-risk asset. This illiquid asset's return advantage, and its risk level, are parameters of the model – users can input different assumptions. By varying these assumptions, the model can show how the optimal mix of illiquid-liquid assets – and the optimal mix of liquid assets – changes.

As mentioned, we assume the investor has a requirement that the portfolio's **liquidation value** must meet a specified **liquidation threshold**. However, the investor must choose the desired confidence level in meeting the liquidity requirement. For example, an investor might say: "I want to be 90% confident that the portfolio's liquidation value will satisfy my liquidation threshold over my investment horizon of 10 years."

There are many choices for modeling the liquidation threshold, and each investor will likely have a different specification to reflect their circumstances. We assume the liquidation threshold grows at an annual rate that depends on the liquid low-risk asset's expected annual return, with a random component such as the unpredictable state of the economy. We can also incorporate the state of the economy when measuring the liquidation value of the liquid portfolio. By making both the liquidation threshold and liquidation value conditional on the state of the economy, we hope to capture some of the real challenges faced by investors: In bad economic states, when the investor's liquidation threshold is increasing unexpectedly, the liquidity portfolio will likely be performing poorly.

The model simulates both the dynamics of the asset returns and, indirectly, the behavior of the liquidation threshold. Depending on the underlying asset assumptions, some key findings from the asset allocation model are:

- As investors increase the portfolio's liquidity requirement, either through a higher liquidation threshold or a higher confidence level, the portfolio's allocation to liquid assets may increase (i.e., the allocation to the illiquid asset decreases); the weight allocated to the liquid high-risk asset may decrease relative to the liquid low-risk asset; and the portfolio's expected value at the horizon date may decline.
- At high levels of confidence in meeting a portfolio's high liquidation threshold, the investor may make only a small (or, no) allocation to the illiquid asset, irrespective of the return advantage of the illiquid asset.
- For a given level of confidence in satisfying the liquidation threshold, increasing the investment horizon may decrease the allocation to the liquid portfolio, as might the allocation to high-risk assets within the liquid portfolio. This supports the oft-heard comment that "long-horizon" investors allocate more to illiquid assets.
- As the expected return advantage of the illiquid asset increases, the investor, for a given level of confidence, may decrease both the allocation to the liquid portfolio and the allocation to the liquid high-risk asset. In other words, the investor may increase the illiquid allocation to pick up any additional return from the illiquid asset but will protect the portfolio's liquidation value by increasing the allocation to the liquid low-risk asset.

Figure 1: Optimal Asset Allocation for Various Liquidity Thresholds and Confidence Levels

% Liquid Assets, High-Risk as % of Liquid Assets				
Liquidation Threshold	60% Conf. Level	70% Conf. Level	80% Conf. Level	90% Conf. Level
20%	{21%, 100%}	{22%, 100%}	{22%, 45%}	{22%, 14%}
50%	{51%, 100%}	{55%, 100%}	{61%, 98%}	{56%, 27%}
70%	{71%, 100%}	{77%, 100%}	{86%, 100%}	{82%, 44%}
80%	{81%, 100%}	{88%, 100%}	{98%, 100%}	{95%, 48%}
90%	{91%, 100%}	{99%, 100%}	{100%, 52%}	{100%, 23%}

Note: Please refer to the paper for the particular model assumptions underlying this figure. Source: PGIM IAS.

Figure 1 shows an example of the optimal asset allocation for various liquidation thresholds and confidence levels. (The underlying model assumptions for this figure are in the main paper.) For example, if the investor has a 70% liquidation threshold and a 70% confidence level (see box outlined in red), the optimal portfolio would have a 77% initial allocation to liquid assets (so, 23% to the illiquid asset) and a 100% allocation to the high-risk asset within the liquid portfolio.

At higher confidence levels, for a given liquidation threshold, the investor must make the liquid portfolio’s liquidation value less risky. This can be accomplished by some combination of either increasing the allocation to the liquid portfolio or decreasing the risk of the liquid portfolio. For example, increasing the confidence level from 70% to 80% increases the allocation to liquid assets from 77% to 86%. Note that the allocation to the liquid high-risk asset, *as a percentage of the liquid portfolio*, remains unchanged at 100%. The size of the liquid portfolio is now larger providing a sufficient buffer to its liquidation value stability to satisfy the higher confidence level.

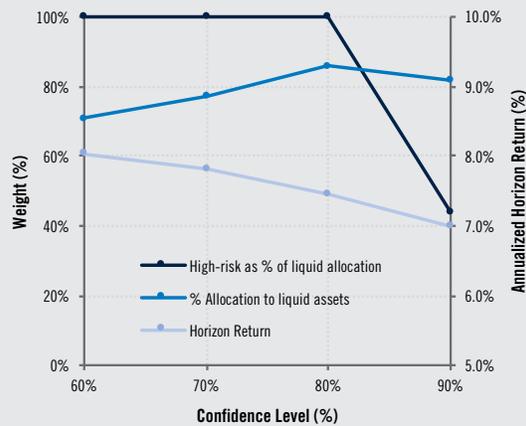
However, at even higher confidence levels (say, 90%), the portfolio may *decrease* the allocation to liquid assets. From the perspective of maximizing horizon returns, increasing the allocation to the liquid portfolio to satisfy a higher confidence level is painful given the assumed return advantage of the illiquid asset over the liquid high-risk asset. A less painful way to satisfy the higher confidence level and to maintain returns might be to modestly increase the allocation to the illiquid asset with a more significant decrease in high-risk assets within the liquid asset allocation. These actions generate stability in the liquid portfolio’s liquidation value so as to meet the liquidation threshold with greater confidence, while allowing for some allocation to the illiquid asset. This points to more of a “barbell” portfolio approach, as low-risk liquid assets are paired with the higher-risk illiquid asset.

Figure 2 more clearly frames the risk – return tradeoff faced by many CIOs and investment committees: **“What does it cost to be more confident about meeting liquidity requirements?”** As the confidence requirement increases from 60% to 90%, portfolio returns fall from 8%/y to 7%/y.

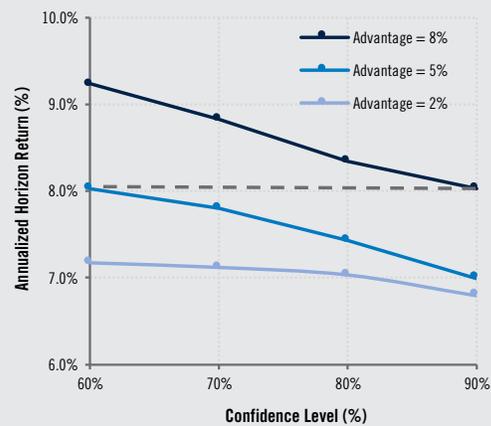
We can also use the model to investigate the ramifications on the optimal asset allocation by changing the illiquid asset’s assumed return advantage over the liquid high-risk asset. In addition, the model can be used to assess the tradeoff between the magnitude of the illiquid asset’s return advantage and an investor’s desired confidence level on meeting the liquidation threshold. For example (see Figure 3 above), if an investor required a certain portfolio horizon return at a 60% confidence level, but now needs to be 90% confident, the illiquid asset’s return advantage needs to increase from 5% to 8% to maintain the same horizon average expected return (see the dashed line).

Investors may also be interested in the behavior of the portfolio *throughout the horizon period*. The model provides details on how the investor’s liquid portfolio’s liquidation value evolves over time in relation to the investor’s liquidation requirements. The model can help answer: ***How much might the liquidation value fall short of the liquidation threshold in a given month over the investment horizon?***

**Figure 2:
Asset Allocation & Portfolio Returns**



**Figure 3:
Illiquid Return Advantage & Portfolio Returns**



Note: Please refer to the paper for the particular model assumptions underlying Figures 2 and 3. Source: PGIM IAS.

The higher expected returns of illiquid assets may help improve portfolio performance. However, a challenge for investors is to determine their allocation to illiquid assets subject to their cash flow obligations. We have developed a stylized asset allocation framework to help investors better understand the issues involved with allocating to illiquid assets. The risk for the investor is the risk of not having enough liquid assets over the investment horizon. Consequently, the fundamental tradeoff for investors is between their wealth at the horizon date versus their confidence in being able to satisfy their liquidity needs (i.e., available cash) up to the horizon date.

Our illiquid-liquid asset allocation model addresses several issues when considering illiquid private assets:

- Determining the optimal allocation between liquid and illiquid assets. The model highlights that this allocation can be quite sensitive to changes in the investor's liquidity requirements, and the allocation may move in unanticipated directions at high liquidity requirements.
- Understanding the interaction between an investor's liquidity requirements and the investor's objective of maximizing horizon returns. Specifically, the model quantifies the cost of changes to the investor's liquidity constraint.
- Refining the appropriate level of high-risk assets in the liquid portfolio. The investor's optimal illiquid-liquid asset allocation choice affects the optimal asset allocation within the investor's liquid asset portfolio.

Our model framework is intuitive and flexible and can be customized to accommodate different asset types and liquidity requirements. Our hope is that this framework will help CIOs and fiduciaries make more informed decisions with respect to their strategic investments in illiquid private assets.

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