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Improving Private Asset Benchmarks for Asset Owners and Managers

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Overview

We will explore the challenges of benchmarking private equity by looking into several alternatives, and discuss best practices:

- Private vs. private: A Private Fund returns are benchmarked against the returns of another Private Fund or a portfolio thereof

- Private vs. public: A Private Fund returns are benchmarked against the returns of a Public Asset or a portfolio thereof

- PME-style benchmarking: An implicit benchmarking calculation that looks at the incremental payoff multiple of the Private Fund in comparison to a Public Asset or a portfolio thereof

- Liability-driven benchmarking: An analysis of the shortfall probability of a portfolio consisting of liquid and illiquid private assets to meet liabilities in future periods of time

Private Asset vs. Private Benchmark

- There are a number of varieties:
  - Compare the returns of an asset against an average of other assets with similar characteristics – vintage, vintage, strategy, etc.
  - Compare the returns of an asset against that of a single other asset with similar characteristics – vintage, vintage, strategy, etc.
  - Other varieties – medians, combination between different characteristics
- What is the textbook definition of a benchmark:
  - *an efficient (minimal variance) portfolio that meets certain constraints that also apply to the asset we benchmark*
  - none of the above varieties necessarily meet this criteria by construction

Private vs. Private (cont'd)

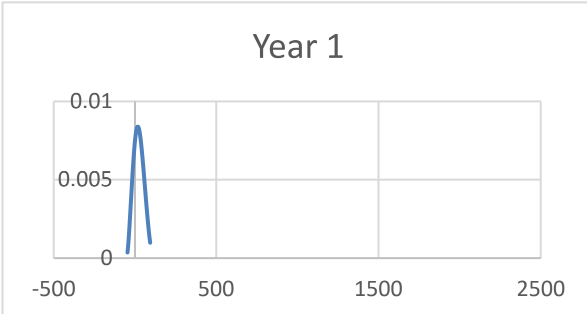
- How can one construct a benchmark:
  - Consider a universe of investments
  - Limit the universe to only those investments that satisfy the constraints which also apply to the asset we benchmark – vintage, strategy, etc.
  - Construct a covariance matrix of all the funds in the filtered universe
  - Perform Mean Variance Optimization on the covariance matrix to derive the optimal set of weights for each fund in the benchmark

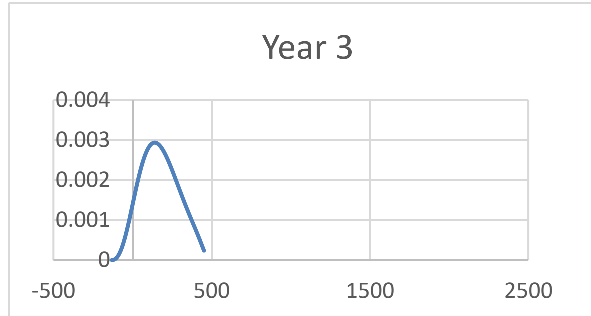
- *"…Construct a covariance matrix of all the funds in the filtered universe…" How?*
  - Can we use fund manager reported historical returns to calculate covariances? *No – they are smoothed, subjective, and historical*
  - Can we use unsmoothed manager returns? *No – unsmoothing introduces estimation error that magnifies with the larger universe of funds*
  - **Then what can we do?**

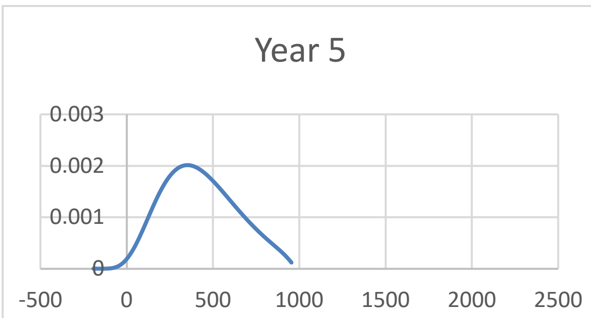
Private vs. Private (cont'd)

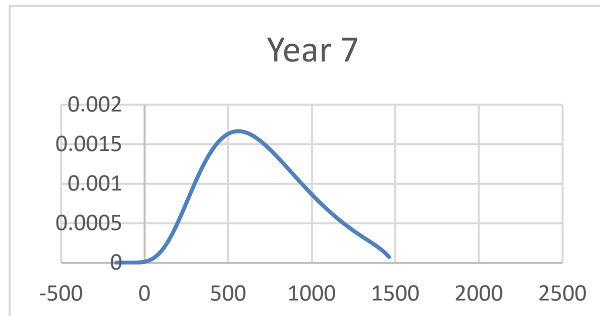
- Derive covariances based on a risk model
- Should we consider buy-and-hold or liquidation at any particular period
- Liquidation is disadvantageous due to high transaction cost, so rarely assumed ex-ante
- Therefore, it is most appropriate to assume that a fund and, in parallel, the benchmark constituents are held until their stated fund maturity
- The covariances should account for the J-curve of asset fund performance over time
- We Illustrate this by building statistical distributions for each fund's performance over its lifetime using a robust simulation algorithm (*10^{21} realization paths*), developed by Northfield partner Aspequity:

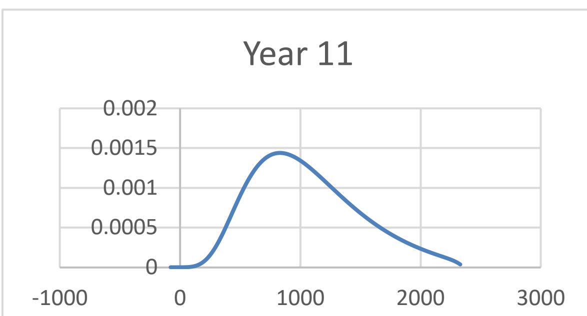
Statistical Distribution of Cumulative Fund Value











Multi-period Covariance

- Build the cumulative value statistical distribution of a standalone fund **B** over **T** periods, as just shown. Calculate the realized standard deviation of outcomes of this distribution: $\boldsymbol{\sigma_{B,T}}$

- Utilizing again the simulation algorithm build a statistical distribution of the cumulative value of one fund **B** as "driven" solely by another fund **A**, period by period, based on a single period beta of B to A, which is derived using a single-period risk factor model. Calculate the realized standard deviation of outcomes of this distribution: $\boldsymbol{\sigma_{B\sim f(A),T}}$

- The correlation of funds A and B is equal to the ratio of $\boldsymbol{\sigma_{B,T}}$ and $\boldsymbol{\sigma_{B\sim f(A),T}}$ Proof shown next.

Correlations from Cumulative Value Distributions

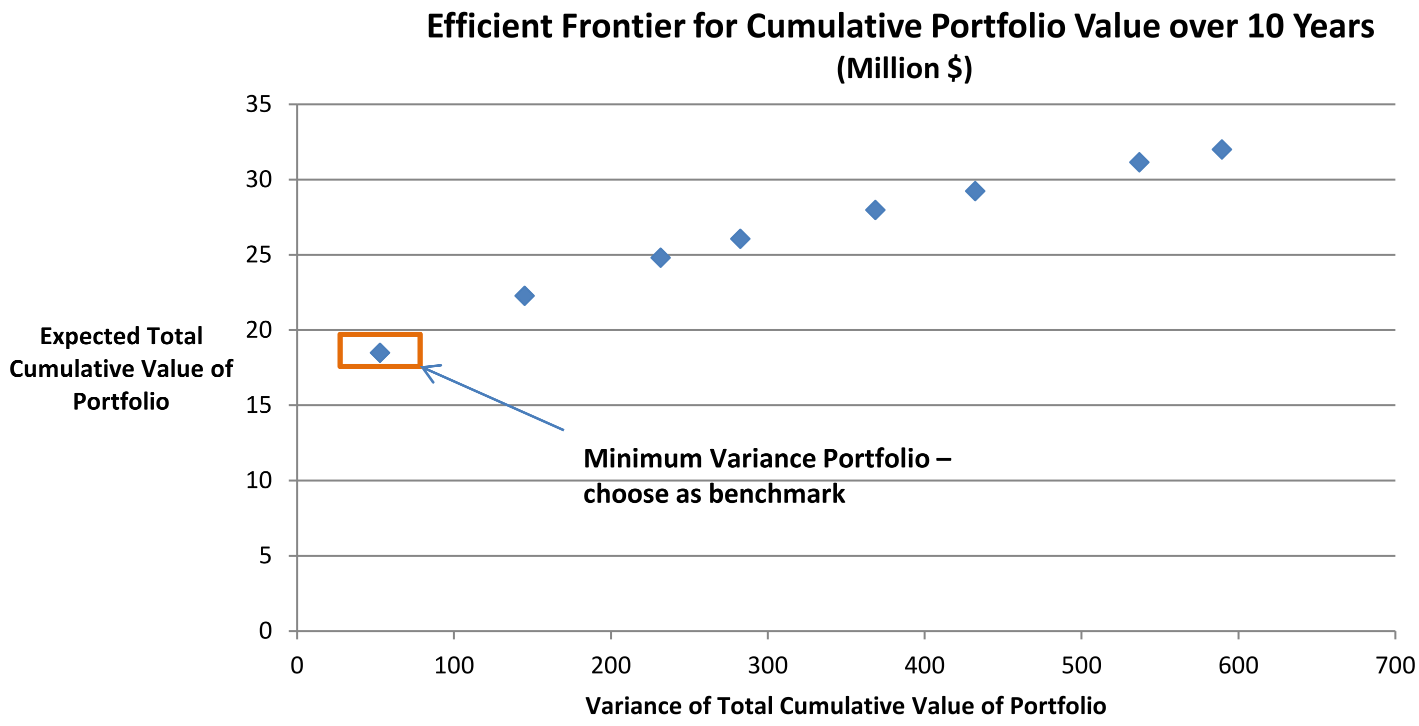
- **Can be estimated from the projected cumulative cash flow distribution processes for $\boldsymbol{B}$ and $\boldsymbol{B \sim f(A)}$**

- **A computational short-cut:**

$$Corr_{Horizon\,T}(B,A) = \frac{\sigma_{B\sim f(A),T}}{\sigma_{B,T}} = \frac{\beta_{B-to-A,T} * \sigma_{A,T}}{\sigma_{B,T}} = \frac{COV(B,A)_T * \sigma_{A,T}}{{\sigma_{A,T}}^2 * \sigma_{B,T}}$$
$$= \frac{COV(B,A)_T}{\sigma_{A,T} * \sigma_{B,T}}$$

where $\sigma_{B\sim f(A),T}$ and $\sigma_{B,T}$ come directly from the projected cumulative cash flow distribution processes for B and $B\sim f(A)$

Efficient Portfolios by Combining Private Funds



Private Asset vs. Public Benchmark

- A number of varieties, but most often the benchmark chosen is a public index plus a margin on top. Clearly, there are two parameters to this formulation:
  - What public index to choose; traditionally those would have some small-cap stock content, or at least very broad representation – e.g. Russell 3000
  - The thornier question: *What should be margin on top be?*

- Three general issues with this category of benchmarking:
  - Illiquidity premium of private equity
  - Smoothing of private asset returns
  - Periodicity of reporting

Private vs. Public (cont'd)

What is the appropriate Margin on top of the public index ?

- Many (subjective) varieties: a vendor supplied capital market assumptions, use CAPM, expert consensus, etc.

A rigorous approach would be:

- Use a valuation model on the public market index and infer embedded risk aversion from the traded price P
- Use a valuation model on the private asset and infer embedded risk aversion; can be done using either through a recent secondary transaction or a recent commitment as an input for value
- Price the public market index with the private asset risk aversion and derive price P1
- *Margin over a public index for PE benchmarking = 100 * (P – P1)/P*
- This margin can be thought of to reflect the illiquidity premium

Valuation Models

Two possibilities to price the statistical distributions of cumulative fund value we demonstrated earlier:

- A valuation model developed by Northfield partner Aspequity. It finds the certainty equivalent of a utility function of this form, which captures higher distributional moments:

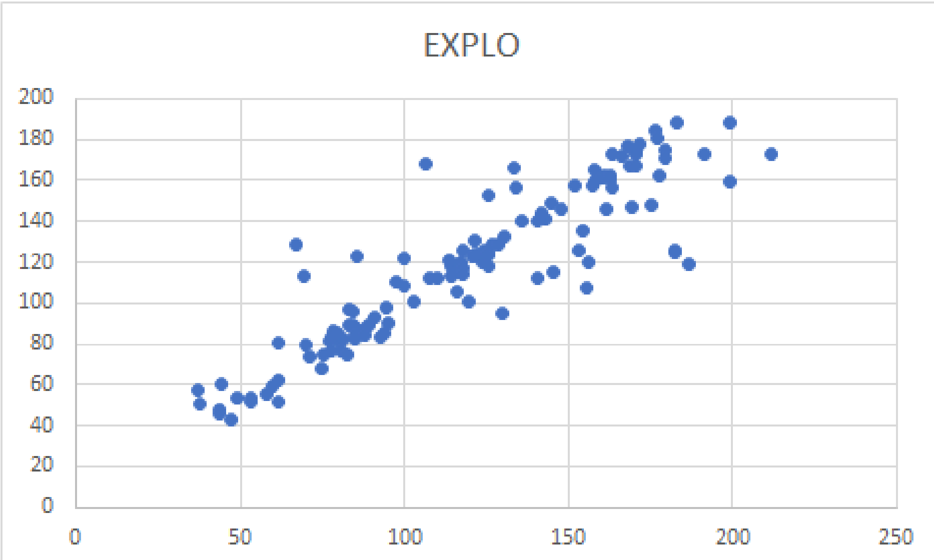
  Utility = Expected Profit – Risk Aversion * Expected Loss

- A valuation model based on the certainty equivalent of a mean variance utility function

DCF models based on single-period discount rates (e.g. CAPM) make non-observable assumptions (how is the multi-period beta of PE derived?), and not to be used to long term illiquid assets.

Market Comps methods are inherently "somebody else's black box", and leave us in the dark about their biases and changing market conditions

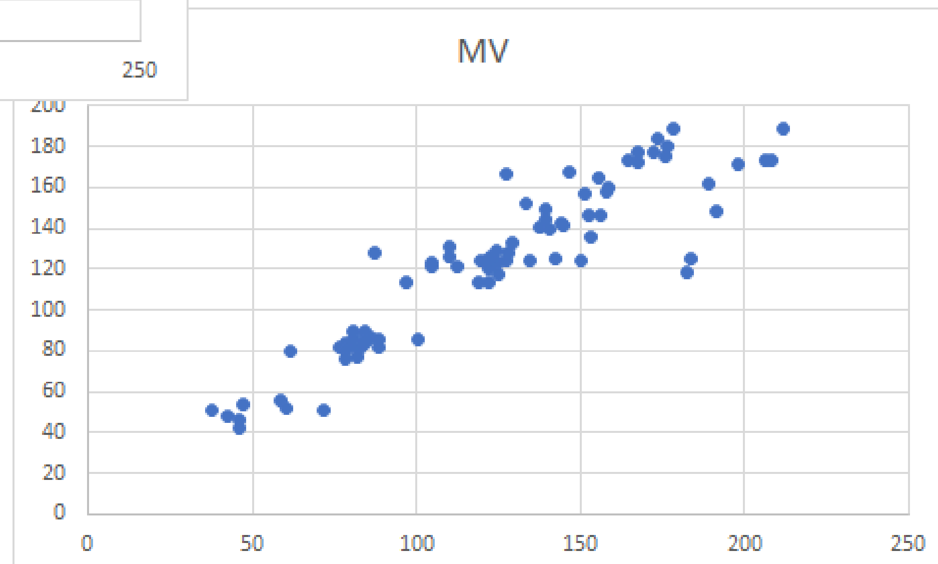
Valuation Models (cont'd)



*Use the two valuation models to price the **Russell 3000 index** for the last two decades*

Compare to actual prices

Use the average share dividend, forecast cumulative value and price using an implicit risk aversion according to each model



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Private vs. Public: Remaining Issues

- Smoothing of private asset returns
  - Due to smoothing, public returns will be much more volatile compared to the subjective and appraisal based returns reported by funds
  - The term "*dislocation*" was coined to "*explain*" this
  - As noted, econometric unsmoothing introduces estimation error that does not diversify, so we don't want to use it in benchmarking
  - Substitute appraisal values with the economic valuations derived with the models described previously, utilizing changing economic and market conditions - *this issue disappears*
- Periodicity of reporting
  - A data point discrepancy: public indices are priced daily, funds are priced quarterly
  - Perform economic valuations at the same periodicity as the public index - *this issue disappears*

Public Market Equivalent (PME) Approach

- Cumulative PME (Kaplan-Schoar)
  - Compound historical contributions and distributions of a fund by the historical return of chosen public market index; we get respectively the quantities FV(Distr.) and FV(Contr.) as of time Now
  - PME = [FV(Distr.) + NAV] / FV(Contr.)

- Direct Alpha (Gredil, Griffiths, Stucke)
  - Finds the Alpha equivalent of IRR

- PME Considerations:
  - Both of these methods are point estimates based on the past performance
  - If inferences about the future are to be made, we need to be able to forecast these metrics

Forecast PME and Direct Alpha

Using the simulation and covariance methodology described previously one can:

- Calculate Forward looking PME:
  - Run a simulation over the remaining fund life $\boldsymbol{T}$ of a ratio where in the numerator distributions are reinvested by the market index simulated return and a denominator where contributions are reinvested by the market index simulated return. We can show that the average of the simulated ratio statistical distributions is the expected forward looking PME.

- Calculate Forward looking Direct Alpha:
  - Take the ratio of the average cumulative value from the standalone fund distribution and the average from a "public-driven-only" fund distribution; from our prior covariance discussion these are respectively averages of the processes $\boldsymbol{B}$ and $\boldsymbol{B \sim f(A)}$, where $\boldsymbol{A}$ is not a another fund but the market index. We can show that the ratio of the these averages is also equal to:

$$(1 + Expected\ Direct\ Alpha)^T$$

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Liability-Driven Benchmarking

- This Benchmarking Approach only makes sense about the future:
  - Satisfying liabilities in the past is a binary variable
  - Satisfying liabilities in the future is a probabilistic variable
- It is relevant to investors with identifiable periodic liabilities in the future – pensions, insurance companies, endowments, and not rarely - SWF
- Duration-matching is a *pointless exercise* in the presence of private (not-marketable) assets.
- What matters is explicitly meeting future liquidity targets that reflect liability outflows

Liquidity Planning

- Create Pacing Models for Private Asset Investment Cash Flows

  Enhanced version of Takahashi and Alexander model

- Incorporate Uncertainty of Cash Flows

  Best of breed risk factor models for equity, debt, and real assets form Northfield

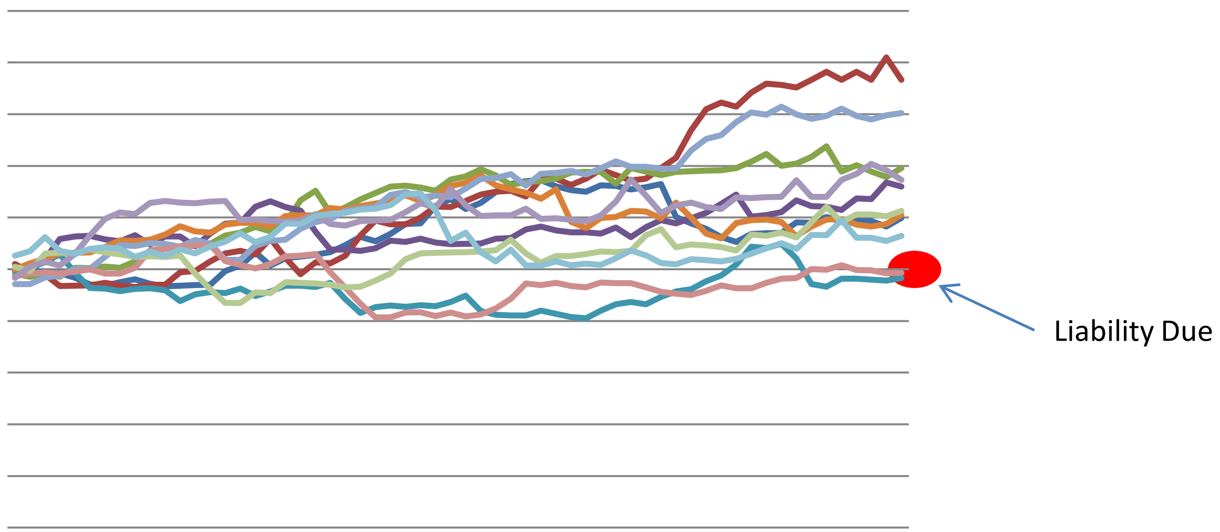
- Convert cash flow projections to cumulative, multi-period statistical probability distributions of liquid resources available in each future period

  Super efficient simulation engine from Aspequity instantaneously captures 10^{21} cash flows paths over ten year investment horizon

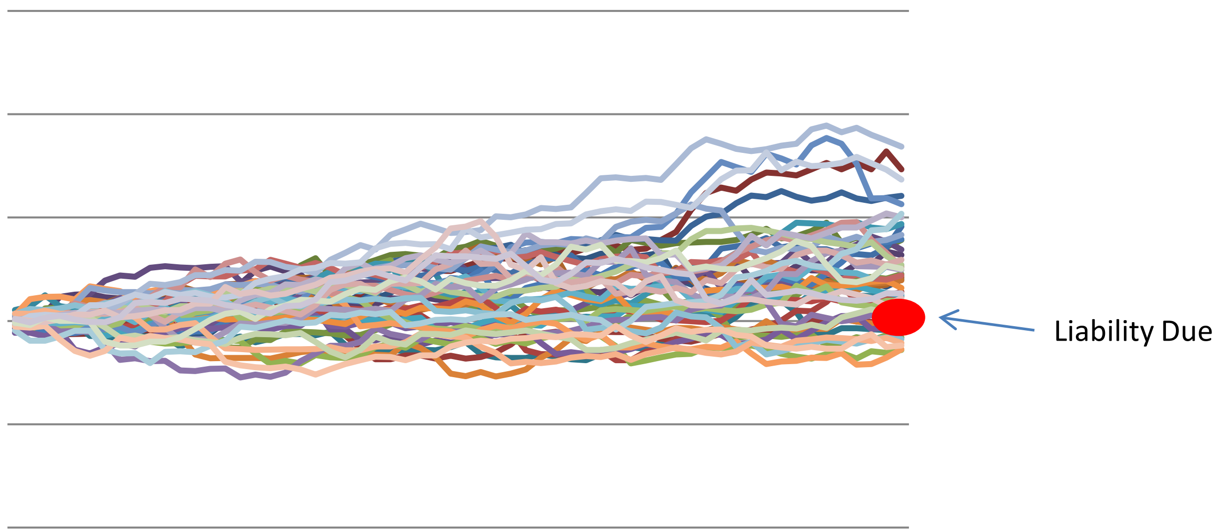
- Build covariance matrix of asset class cumulative value and probability distribution thereof of liquid resources available in period N. Calculate the p-value where liabilities plot on this probability distribution. We can also build an efficient frontier of the tradeoff between preset confidence liquidity capacity level and expected long term portfolio value. Pick optimal portfolio based on a desired confidence level (e.g. 85%).

  Northfield's optimization application automatically builds the efficient frontier based on cash flow covariance model inputs

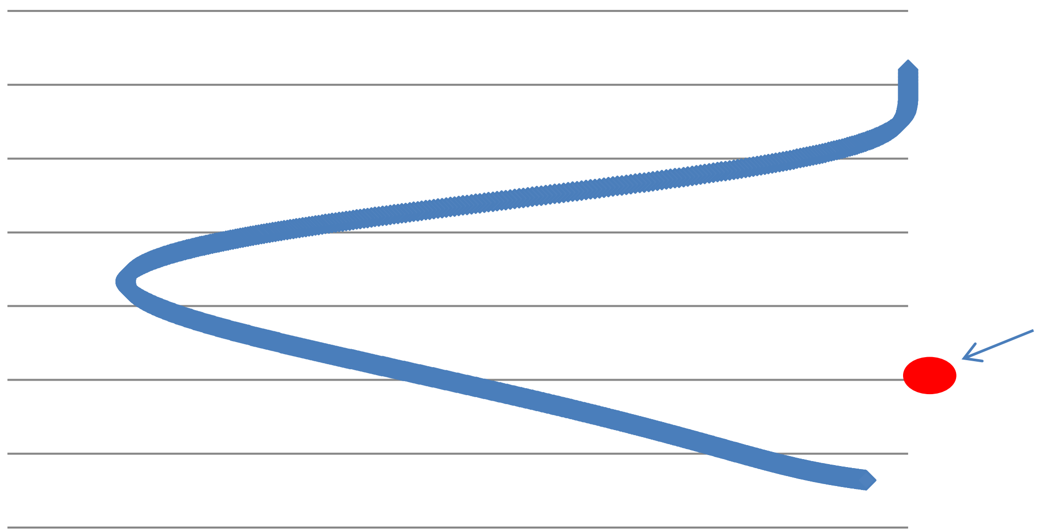
Liquidity Planning Illustrated



...more paths...



…our Solution



Using 10^{21} cumulative value paths provides a continuous probability distribution which immensely reduces sampling error of Monte Carlo simulations

Conclusions

- Benchmarking private equity is much less developed and standardized than benchmarking public equity
- Several general approaches have evolved in the industry and academia, and have been adopted in practice with varieties around these common themes
- Lack of rigor and standard of methodology pervade many of the practical implementations, producing subjective and unreliable outcomes in the investment area where this is most undesirable - benchmarking
- Using a set of robust approaches and technology, the investment practitioner can remedy or mitigate some of these deficiencies and produce much more accurate outcomes
- The same discussion applies to most other private asset classes

Thank you

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