INSTITUTE for PRIVATE CAPITAL

Performance Analysis and Attribution with Alternative Investments

Institute for Private Capital
Prof. Greg Brown (gregwbrown@unc.edu)

Agenda

- White Paper Overview
  - Available here: https://uncipc.org/index.php/publication/performance-analysis-and-attribution-with-alternative-investments/
- Private Fund Performance Metrics
  - TVPI, IRR, PME, Direct Alpha
  - Example and some details to consider
- Benchmarking Selection and Its Effects
- Other Issues
- Q&A

White Paper Project in Partnership with IPC's Research Council

- **Peter Cornelius**: Managing Director, AlpInvest
- **Paul Finlayson**: Senior Vice President & Product Manager, Northern Trust
- **Barry Griffiths**: Partner, Landmark Partners
- **Dominic Garcia**: Chief Pension Investment Strategist, CBRE Global Investors
- **Andra Ghent**: Professor, Department of Finance, David Eccles School of Business, University of Utah
- **Tom Keck**: Partner, StepStone Group (Lisa Larsson also assisted with the paper)
- **Pierre-Yves Mathonet**, Head of Risk, Private Equities Department, ADIA

White Paper Research Contributions by:

- Matteo Binfare, Wendy Hu, Christian Lundblad, Richard Maxwell, Shawn Munday, and Lu Yi (and others at IPC partner organizations)

White Paper Overview

- Private fund performance analysis and attribution is difficult for all the reasons we know:
  - Lack of market return time series
  - Uncertainty about benchmarks and risk loadings
  - Lack of long/accurate data series for some assets

- Current goal: to start codifying best practices and provide some historical context (where we can)
  - Ultimate goal is common agreement of how to evaluate complete portfolios of liquid, semi-liquid, and illiquid assets
  - Holy Grail: dynamic portfolio optimization across all asset types

Outline of Whitepaper

- Survey of extant literature and common metrics
- Analysis of specific asset types:
  - Hedge Funds
  - Private Equity Funds (VC, expansion, buyout, generalists)
  - Private Credit Funds (Senior, Mezzanine, Distressed, Generalists)
  - Real Assets (Real Estate: Value-add, Opportunistic, Generalist)
  - Buyout deal-level attribution
- Diversified Portfolio Factor Model Approach
  - Initial step toward portfolio optimization
- Download from: uncipc.org

Measuring private asset performance

- Returns – Various methods, but most common are:
  - Multiples (MOIC & TVPI)
  - Internal Rate of Return (IRR)
  - Public Market Equivalent (PME)
  - Direct Alphas (DA)

- Risk – Challenging because time-series of true prices not observed
  - Benchmark selection
  - Leverage adjustment
  - Risk factor approach

Multiples

- Multiples simply measure the ratio of cash outflows to cash inflows
  - MOIC = multiple on invested capital (more commonly used at deal level)
  - TVPI = total value to paid in capital (more commonly used at fund level)

    … but fundamentally the same thing.
  - A multiple >1.0 is a profitable investment and a multiple <1.0 is an investment with a loss.
  - If the investment is not fully realized, an estimate of unrealized value (e.g., most recent NAV) is used as a terminal cash flow.
    - This is the case for other performance measures as well

Pros	Cons
• Easy to calculate • Intuitive • Commonly used	• No adjustment for risk • No adjustment for investment horizon

Internal Rate of Return (IRR)

- The IRR measures the annualized return of the cash flows
  - Defined as the discount rate that sets the net present value of all periodic cash flows (CF_t) to zero:

$$0 = \sum_{t=0}^{T} \frac{CF_t}{(1 + IRR)^t}$$

  - An IRR can be compared to an appropriate opportunity cost of capital to determine if an investment was good or bad

Pros	Cons
• Easy to calculate • Intuitive • Commonly used	• No explicit adjustment for risk • Assumes cash flows are reinvested at the IRR which is unlikely if the IRR is very high (or very low)

Public Market Equivalent (PME)

- Like the multiple, the PME measures the ratio of cash inflows to cash outflows, however the cash flows are future values calculated using realized rates of return for a public market benchmark.
  - A PME>1 (<1) means the investment returned more (less) than the public benchmark.

$$PME = \frac{\sum_{t=0}^{T} CF_t^{inflow}(1 + R_t^M)}{\sum_{t=0}^{T} CF_t^{outflow}(1 + R_t^M)}$$

where R_t^M is the total return on the public market benchmark between *t* and *T*.

Pros	Cons
• Allows for explicit comparison to a public market benchmark • Provides a precise estimate of the total outperformance, e.g., a PME=1.25 means the investment provided a total return that was 25% higher than the public market benchmark	• Need to pick an appropriate public market benchmark • Does not adjust for investment time horizon, e.g., a PME of 1.25 for a 5-year investment is much better than for a 10-year investment

There are different flavors of PME but the method in Kaplan-Schoar (2005) is used the most in research.

Direct Alpha (DA)

- Direct Alpha measures the excess return over the benchmark return by calculating the IRR of the future value of all cash flows obtained (as with PME) using returns on a public market benchmark (R_t^M)
  - A DA>0% (<0%) means the investment returned more (less) than the public benchmark.

$$0 = \sum_{t=0}^{T} \frac{CF_t(1 + R_t^M)}{(1 + DA)^t}$$

Pros	Cons
• Allows for explicit comparison to a public market benchmark • Provides a precise estimate of the total outperformance on an annualized basis, e.g., a DA=3% means the investment on average returned 3% more than the public benchmark.	• Need to pick an appropriate public market benchmark

For more details see, Gredil, Griffiths, and Stucke, 2014, Benchmarking Private Equity: The Direct Alpha Method https://ssrn.com/abstract=2403521

Toy example of performance metrics

Data			
Year	Benchmark Return (t, t+1)	Contributions	Distributions
0	15%	15	0
1	3%	25	0
2	10%	35	5
3	8%	20	10
4	-5%	5	20
5	25%	0	15
6	5%	0	30
7	19%	0	10
8	-3%	0	20
9	7%	0	25
10		0	15
Total	8%	100	150
Future Value		185	195

Performance Metrics			
TVPI	IRR	PME	Direct Alpha
1.50	9.20%	1.05	1.20%

- Hypothetical 10-year fund that has $100 in capital calls in years 0-4 and $150 in distributions in years 2-10.
- In this case the TVPI is 1.50
- The IRR is 9.20% which is higher than the annualized benchmark return suggesting the fund did better than the benchmark.
- The PME is 1.05 which is the ratio of the future value of Distributions ($195) to the future value of Contributions ($185) and indicates that the fund provided 5% more total value than if the same investments were made in the public market benchmark.
- The Direct Alpha is 1.20% which indicates that the fund provided an average annual return that was 1.2% higher than the benchmark.
  - As shown next, it is a coincidence that the Direct Alpha is the same as the difference between the benchmark return and the IRR.

Toy example – Timing matters

	Benchmark Return	TVPI	IRR	PME	Direct Alpha
Typical Market (previous example)	8.0%	1.50	9.20%	1.05	1.20%
Bear Followed by Bull Market	8.0%	1.50	9.20%	1.13	2.98%
Bull Followed by Bear Market	8.0%	1.50	9.20%	0.98	-0.32%

- The path of market returns can affect performance assessment
- We consider the previous example (typical market) with two other scenarios
  - Reorder benchmark returns from lowest to highest (bear followed by bull market)
  - Reorder benchmark returns from highest to lowest (bull followed by bear market)
- Note that in all 3 scenarios the annualized benchmark return remains the same (8.0%) as does the TVPI (1.50) and the IRR (9.20%)
- However, the PMEs and Direct Alphas change with the timing of benchmark returns:
  - For the bear market followed by bull market the PME and Direct Alpha increase, because the future value of relative fund cash flows benefited from this market environment
  - For the bull market followed by bear market the PME falls below 1.0 and the Direct Alpha becomes negative, indicating that the fund underperformed the benchmark in this market environment
- This example shows how comparing IRRs to market returns can be misleading

Selecting the benchmark

INSTITUTE for PRIVATE CAPITAL

There are two schools of thought on selecting the right benchmark:

1. Pick a benchmark that matches the underlying fund assets as closely as possible
   - This approach focuses on making an “apples-to-apples” comparison with the view that investing in the benchmark was an alternative to investing in the fund
   - For example, a small-cap value index might be used for buyout funds and a REIT index might be used for real estate private equity funds
   - This is a preferred approach when evaluating the skill of a manager
2. Pick a benchmark that characterizes the asset class risk exposures
   - This approach considers the performance of the fund as part of a broader portfolio and assumes that diversifiable risks (e.g., from sector or size) do not matter
   - For example, a total market index might be used for buyout funds
   - This is a preferred approach when evaluating how a fund contributes to overall portfolio performance

Fund Level PE Excess Returns

All Global Equity Funds (Pooled)

	Historical Excess Returns (Direct Alphas)				
Benchmark (Beta=1.0)	3-year	5-year	10-year	15-year	25-year
MSCI ACWI	5.62%	2.38%	4.24%	4.53%	5.77%

Data from MSCI-Burgiss through December 2020 for vintages 1987-2016. Full details are available in the white paper (available at uncipc.com): Performance Analysis and Attribution with Alternative Investments.

Fund Level PE Excess Returns

All Global Equity Funds (Pooled)

	Historical Excess Returns (Direct Alphas)				
Benchmark (Beta=1.0)	3-year	5-year	10-year	15-year	25-year
MSCI ACWI	5.62%	2.38%	4.24%	4.53%	5.77%
MSCI ACWI Value	12.90%	6.13%	6.31%	6.16%	10.65%
MSCI ACWI Growth	-0.65%	-0.90%	2.40%	3.10%	8.91%

Data from MSCI-Burgiss through December 2020 for vintages 1987-2016. Full details are available in the white paper (available at uncipc.com): Performance Analysis and Attribution with Alternative Investments.

Fund Level PE Excess Returns

All Global Equity Funds (Pooled)

	Historical Excess Returns (Direct Alphas)				
Benchmark (Beta=1.0)	3-year	5-year	10-year	15-year	25-year
MSCI ACWI	5.62%	2.38%	4.24%	4.53%	5.77%
MSCI ACWI Value	12.90%	6.13%	6.31%	6.16%	10.65%
MSCI ACWI Growth	-0.65%	-0.90%	2.40%	3.10%	8.91%
MSCI ACWI Small	8.76%	3.28%	4.54%	3.31%	3.95%
MSCI ACWI Small Value	14.30%	5.75%	5.72%	4.05%	3.90%
MSCI ACWI Small Growth	3.90%	1.11%	3.52%	2.69%	4.07%

Data from MSCI-Burgiss through December 2020 for vintages 1987-2016. Full details are available in the white paper (available at uncipc.com): Performance Analysis and Attribution with Alternative Investments.

Fund Level PE Excess Returns

All Global Equity Funds (Pooled)

	Historical Excess Returns (Direct Alphas)				
Benchmark (Beta=1.0)	3-year	5-year	10-year	15-year	25-year
Russell 3000	2.02%	0.20%	0.23%	2.19%	3.81%
MSCI EAFE	11.59%	6.87%	7.60%	7.22%	7.74%

Data from MSCI-Burgiss through December 2020 for vintages 1987-2016. Full details are available in the white paper (available at uncipc.com): Performance Analysis and Attribution with Alternative Investments.

Fund Level PE Excess Returns

All Global Equity Funds (Pooled)

	Historical Excess Returns (Direct Alphas)				
Benchmark (Beta=1.0)	3-year	5-year	10-year	15-year	25-year
Russell 3000	2.02%	0.20%	0.23%	2.19%	3.81%
MSCI EAFE	11.59%	6.87%	7.60%	7.22%	7.74%
PE Region-mix Index	4.70%	1.81%	3.13%	3.86%	4.94%
PE Sector-mix Index	2.13%	-0.23%	2.47%	3.29%	4.97%
PE Sector-Region-mix Index	**2.21%**	**0.27%**	**1.42%**	**2.89%**	**4.49%**

Data from MSCI-Burgiss through December 2020 for vintages 1987-2016. Full details are available in the white paper (available at uncipc.com): Performance Analysis and Attribution with Alternative Investments.

Risk-adjusting the benchmark

- Evidence suggests that private fund returns generally have higher systematic risk than public benchmarks*
  - For example, the use of substantial leverage in buyout transactions likely leads to above average risk for these investments
- Recent estimates suggest market betas for most funds are in the range of 0.8-1.3 for buyout funds and for venture funds of about 1.0-2.0 for VC funds
  - Value-weighted portfolios of funds have higher betas because larger funds tend to have higher betas
  - There appears to be considerable cross-sectional and time-series (vintage year) variation in betas (see next slide for estimates)
- Benchmarks can be adjusted for leverage using an appropriate beta (β).

$$r_t^{M*} = r_t^f + \beta * \left(r_t^M - r_t^f \right)$$

where r^{M*} is the adjusted benchmark return, r^M is the unadjusted benchmark return, and r^f is the risk-free rate.

*For more details see, Korteweg, 2019, Risk Adjustment in Private Equity Returns, *Annual Review of Financial Economics* 11(1), 131-152, and Brown, Ghysels, and Gredil, 2021, Nowcasting Net Asset Values: The Case of Private Equity, Institute for Private Capital working paper https://ssrn.com/abstract=3507873.

Other Methods for Risk-adjusted Performance

INSTITUTE for PRIVATE CAPITAL

Portfolio Models

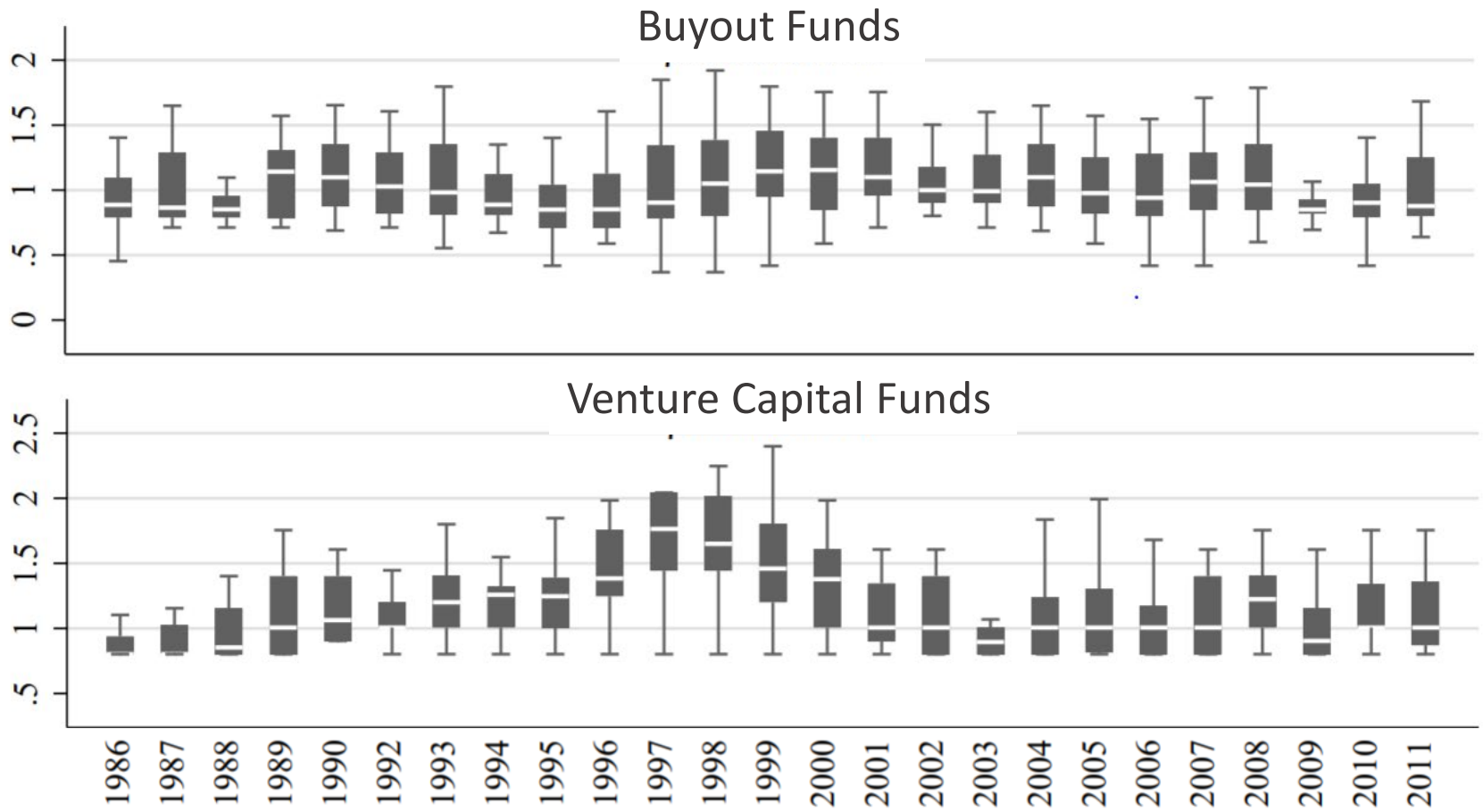
- Generalized PME (GPME) of Korteweg & Nagel
  - Risk-Adjusting the Returns to Venture Capital, *Journal of Finance* 71(3), 2016, 1437-1470.
  - Risk-Adjusted Returns of Private Equity Funds: A New Approach, https://ssrn.com/abstract=4157952
- Bayesian Markov Chain Monte Carlo (MCMC) Model
  - Ang, Chen, Goetzmann, and Phalippou, Estimating Private Equity Returns from Limited Partner Cash Flows, *Journal of Finance* 73(4), 2018, 1751-1783.
- Strips Method
  - Gupta and Van Nieuwerburgh, Valuing Private Equity Investments Strip by Strip, *Journal of Finance* 76(6), 2021, 3255-3307.

Fund-level Model

- NowCasting
  - Brown, Ghysels, and Gredil, Nowcasting Net Asset Values: The Case of Private Equity, Review of Financial Studies 36(3), 2023, 945-986.

Time-series and cross-sectional variation in market risk

- These box-plots show estimates of market betas by vintage year for buyout and venture capital funds as estimated by Brown, Ghysels, and Gredil (2023)
  - Solid bars show interquartile range and white bar shows median



*Brown, Ghysels, and Gredil, 2023, Nowcasting Net Asset Values: The Case of Private Equity, Institute for Private Capital https://ssrn.com/abstract=3507873.

A factor approach to benchmark selection

- Evidence suggests that private funds are likely to have exposure to other risk factors commonly cited in the literature such as the Fama-French size (SMB) and value (HML) factors.
- Generating benchmark returns that include other risk factors is straightforward. For example,

$$r_t^* = r_t^f + \beta^M \left(r_t^M - r_t^f\right) + \beta^{HML} r_t^{HML} + \beta^{SMB} r_t^{SMB} + \ldots$$

where r^* is the factor-adjusted benchmark return, r^M is the market factor return, r^{HML} is the value factor return, r^{SMB} is the size factor return, r^f is the risk-free rate, and the βs represent factor loadings.

- Factor returns are available from a variety of sources including Ken French's data library.

Other issues

- All performance estimates for funds not fully realized rely on NAVs or some other estimate of current value.
  - Evidence suggests that NAVs are smoothed and systematically biased.*
- Correlations matter for understanding portfolios but are also hard to estimate for private funds.
- Access is not the same for all investors so large sample statistics may not be relevant for a specific investor.
- The degree of diversification (and therefore risk) depends on each specific portfolio – for example, the number and size of fund allocations.
  - Portfolios with only a few private funds will have significant idiosyncratic risk

* See, for example, Brown, Gredil and Kaplan, 2019, Do Private Equity Funds Manipulate Reported Returns?", *Journal of Financial Economics*, 132(2), 267-297.

uncipc.org