Research Insight

July 2025

Tracking Private Equity

Understanding the fundamental drivers of private equity performance

Authors

Peter Shepard

Head of Analytics Research & Development

MSCI Research & Development

Will Baker

Vice President

MSCI Research & Development

Contents

Introduction

The performance of private equity has been as inaccessible and controversial as it has been impressive. Private equity has consistently outperformed public equity markets, with much lower apparent volatility. The performance of top-quartile funds has been even higher. But few have access to the top funds, if any at all, and some (Phalippou, 2020) interpret the performance as little more than levered-up public equity, hidden behind smooth valuations and reduced by high fees. Private equity needs an investible benchmark.

With newly available private equity fundamental data, it's now possible to unpack the drivers of private equity performance to separate what can be replicated in the public markets — sector allocations, leverage and key characteristics such as high growth — from the unique value added by private equity.

Over the past two decades, global private equity has outperformed public equity by about 450 basis points (bps) annually.[1] Of this, our analysis suggests that less than 100 bps were due to higher leverage or market beta, while an additional 200 bps can now be attributed to sector allocations and exposure to replicable factors such as growth.

In some segments of the private markets, exposures to replicable factors explain an even larger share of historical performance. In North American venture capital (VC), the performance of the corresponding public equity tracker has nearly matched the private market, after fees.

Understanding the drivers of private equity performance has suffered from a lack of data, which has often been proxied by anecdote or philosophical debate. A more transparent data set of private equity fundamentals brings a clearer understanding, and enables investible public market trackers reflecting many of the drivers of private equity performance.

Tracking private equity

Private equity performance can't be replicated exactly in the public markets. General partner (GP) management has much more influence over investment companies than public equity funds, GPs may be particularly skilled at deal selection or timing, and private companies are often in different stages or situations than public companies. Private fund structures are more than a wrapper.

Many of the fundamental drivers of private equity performance can be found in the public markets, however. A different sector composition, higher growth, smaller size, leverage and other fundamental characteristics drive the performance of private equity away from the aggregate public markets, but they are all represented there.

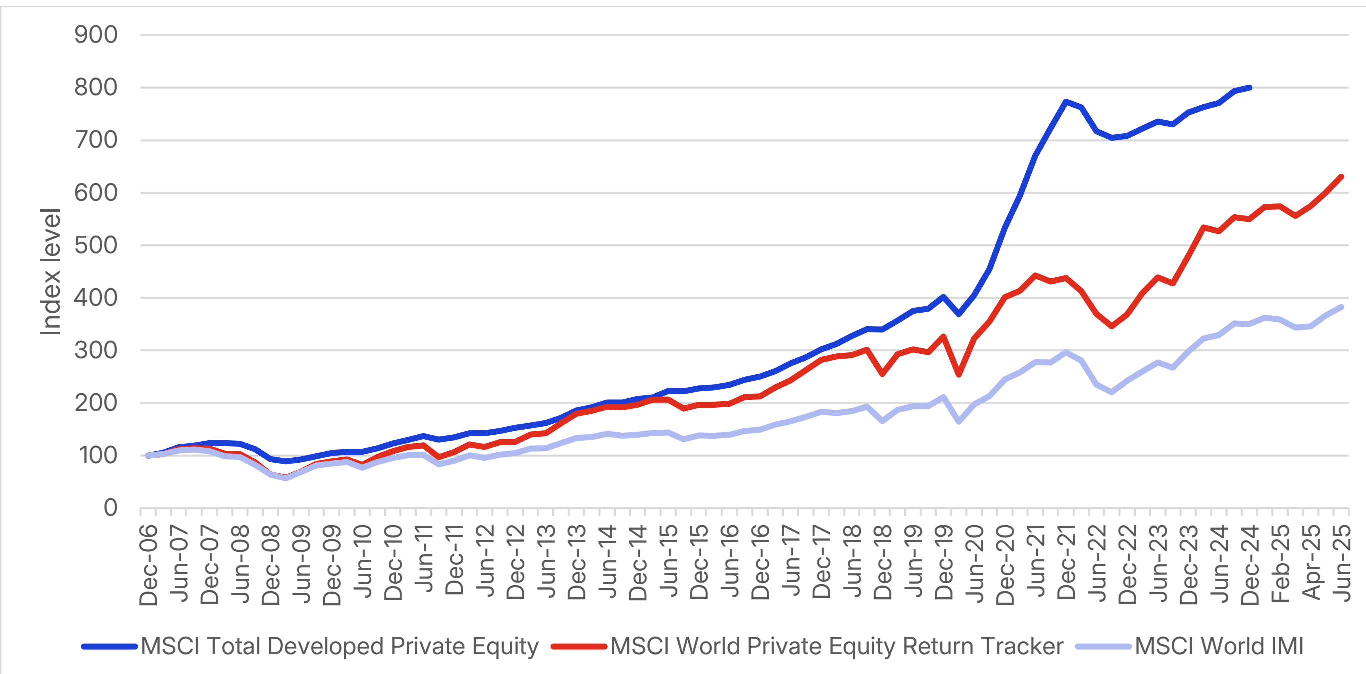
[1] The average annual return of the MSCI Private Equity Index was 12.3% between December 2006 and December 2024, compared with 7.8% for the MSCI World IMI Index over the same period. The private equity benchmark reflects the net-of-fees return of buyouts, venture and growth capital in global developed markets, relative to a USD numeraire.

Lack of transparency has been the main obstacle to differentiating the value-add of private equity from publicly accessible drivers of returns, but we now have private company fundamental data to do just that.

As detailed in the Methodology section below, MSCI's unique data set of deal-level fundamentals and broad private market returns can be used to estimate exposures to investible factors representing many characteristics of private equity. The exposures are not surprising: Buyouts tend to tilt to high growth, leverage, value and low size. Ventures have even larger exposure to growth, and much less leverage.

What may be surprising is how much these exposures have contributed to performance.

Fundamental characteristics explain a large share of private equity outperformance

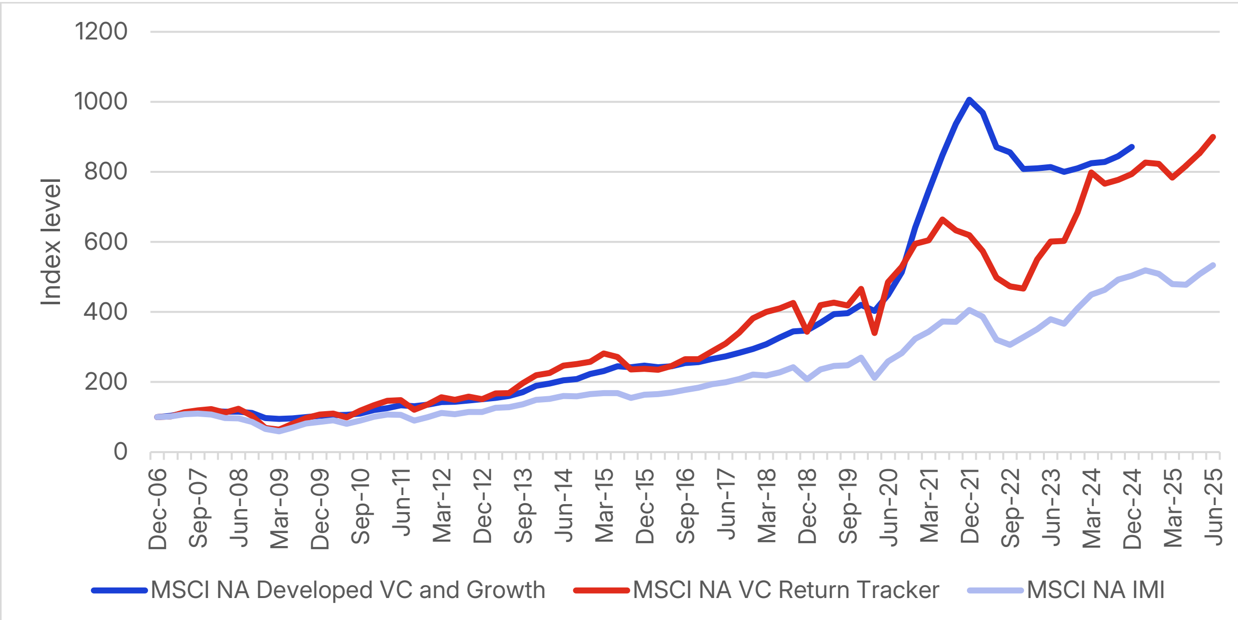


Index	Return	Volatility	Return/ volatility	Beta	Alpha
MSCI Total Developed Private Equity	12.2%	10.0%	1.2	1.1	4.7%
MSCI World Private Equity Return Tracker	9.9%	19.2%	0.5	1.1	2.4%
MSCI World IMI	7.2%	17.7%	0.4	1	0.0%

The performance of the return tracker index has been intermediate to the global private and public equity markets. The table reflects MSCI data between December 2006 and December 2024. Volatility is measured mechanically from quarterly returns (and annualized with $\sqrt{4}$), but does not adjust for smooth valuations. Beta is estimated with our model methodology, as detailed in the following section.

For North American venture and growth capital, the performance of the tracker index has nearly matched the aggregate private market, after fees. Top-quartile venture funds have significantly outperformed that, however, so the results underscore the importance of manager selection and fund access within venture allocations.

The average performance of venture capital has been... average



Index	Return	Volatility	Return/ volatility	Beta	Alpha
MSCI North America Developed VC	12.8%	11.0%	1.2	1.2	1.4%
MSCI North America VC Return Tracker	12.2%	23.8%	0.5	1.2	.9%
MSCI North America IMI	9.4%	17.4%	0.5	1	0.0%

The return tracker index for North American venture and growth capital has performed similarly to the corresponding private markets. The table reflects MSCI data between December 2006 and December 2024. Volatility is measured mechanically from quarterly returns (and annualized with $\sqrt{4}$), but does not adjust for smooth valuations. Beta is estimated with our model methodology, as detailed in the following section.

What can be tracked?

Private assets are private in two distinct ways: They are privately investable, and they hold information private. Both pose significant hurdles to understanding and accessing private equity performance.

MSCI's fundamental private equity dataset shifts what is accessible. Deal-level data provides transparency into the leverage, sector tilts and key fundamental characteristics that have driven significant components of private equity returns.

What is investable?

	Public	Accessible	Private
Broad equity market exposure	x		
Leverage and market beta		x	
Sector tilts		x	
Fundamental factor tilts		x	
GP management skill			x
2 and 20 fees			x

The return tracker indexes represent an intermediate level of accessibility between private equity and the broad public equity market.

Methodology

We estimate exposures of private equity to public market factors with a Bayesian framework combining bottom-up fundamental data with sensitivities from time-series regressions.

The methodology blends fundamental information with robust time-series regressions that account for the smoothness of private equity valuations (Shepard, 2014). What is new is the incorporation of a rich fundamental data set that is aggregated up from individual deals. The methodology consists of the following steps:

- Step 1: Construct building-block market and factor indexes reflecting the sector and country weights of private equity market components
- Step 2: Build prior factor exposures from fundamental data
- Step 3: Translate priors from pure factor exposures to factor index allocations
- Step 4: Update the priors with Bayesian, desmoothed time-series regressions

Together, these provide a robust estimate of public index allocations that replicate the fundamental characteristics of private equity.

Step 1: Constructing the building blocks

First, we construct core market indexes replicating the sector and country weights of each of six main components of private equity: Buyouts and venture/growth capital in developed North America, Europe & Middle East and Pacific.[2]

These core indexes play three roles:

I. They provide overall market exposure in the regressions.

[2] Sector classification is based on the Global Industry Classification Standard (GICS®), the global industry classification standard jointly developed by MSCI and S&P Global Market Intelligence.

II. They define the parent indexes from which the long legs of various style factor indexes are derived.
III. They are the short leg of the market-neutral style factor indexes.

For each of the six market components, we construct six market-neutral style factor indexes:

1. Value
2. Growth
3. Leverage
4. Low size
5. Low volatility (low vol)
6. Momentum

Exposures to the first four factors will be largely informed by fundamental data, while the more technical Low vol and Momentum exposures will be informed from the regressions. See the MSCI World Private Equity Return Tracker Index Methodology (MSCI 2025), for details on the construction of the building-blocks.

Step 2: Factor exposures from fundamental data

To understand the systematic drivers of asset returns, there is widespread use of factors, which associate asset characteristics with exposures to various common drivers of returns: The overall market, industries and style factors such as size, value, growth and momentum.

Asset exposures to the strongest factors — i.e., overall market beta — can be statistically estimated from time-series regressions, but these regressions can be noisy even for strong factors and the high-frequency data of the public markets. For quieter factors or more challenging data, noise may overwhelm the signal.

Instead of relying on time-series regressions, exposures can be built up from fundamental data and other asset characteristics. This is the approach of the MSCI Barra public equity factors, which include industry exposures and a variety of style factors reflecting various asset characteristics relative to the overall market. A stock with above- (below-) average growth is assigned positive (negative) exposure to the growth factor, for example.[3]

In the private markets, where return observations are much less frequent (typically quarterly) and demonstrate a high degree of smoothing over many quarters, the statistical power of regression is much lower. This makes it much harder to understand factor exposures from return timeseries and makes the use of fundamental data all the more important.

However, such fundamental data for private equity has only become available with MSCI's establishment of a global private equity fundamental data set from which broad market exposures can be built.

[3] The overall scale of exposures is a matter of convention. Doubling all exposures and halving all factor returns is exactly equivalent, for example. Barra models typically set the scale such that a unit of exposure corresponds to one standard deviation above average. We set the scale so that each factor index has unit exposure to its corresponding factor.

MSCI's fundamental data set is unique in its coverage of the private equity markets. The data set includes deal-level sector classifications, enterprise value, debt and EBITDA for a broad swath of the global private equity markets. Although much thinner than what is available in the public markets, the data set represents a huge step forward for transparency into private equity markets.

We use this data to inform priors for overall market beta and exposures to style factors reflecting key asset characteristics.

Market beta

The overall market beta of private equity is a critical determinant of the value added from private equity investments.

Measured mechanically from quarterly valuation-based internal rate of returns (IRRs), private equity appears to have much lower beta than similar public companies. If this were true, it would imply that private equity has very little systematic risk, and that general partner (GP) management adds many hundreds of basis points of return, even after fees.

Seen from the fundamentals, there are a variety of influences on the beta of private equity:

- **Leverage**: For leveraged buyouts, the business model has traditionally acquired companies with a large component of debt (on the balance sheet of the deal). Leverage in buyouts has declined in recent years relative to public counterparts, but leverage still contributes to a beta greater than one. For venture and growth capital, leverage is rare and lower than public counterparts, which reduces beta.
- **Sector composition**: The sector allocations of private equity evolve, the betas of large sectors like communication services have increased, and MSCI's transparency data shows allocations have not been as tilted toward low-beta sectors as some have assumed. We capture the sector evolution directly with the changing composition of the core indexes, which re-weight the public equity market to reflect the sector and country weights of each component of the private equity market.
- **Fees**: The fee structure of closed-end private equity funds is much more complicated than the typical description of two-and-twenty — due to hurdle rates, waterfalls, etc. — but nonetheless a 2% intercept and 20% reduction in slope are remarkably good empirical approximations to the relationship between the gross and net returns of private equity. In particular, although hurdle rates might suggest that the 20% only reduces large positive returns, in practice it applies much more broadly, because hurdle rates typically are based on overall cumulative returns. As a result, 20% carry tends to reduce both upside and downside beta (by about 20%).[4]
- **Duration**: The different cashflow and discount-rate profiles of public and private equity contribute to a slightly lower expectation of private equity betas. Generally higher cashflow growth rates tend to extend the duration (putting more of the present value further into the future) while a liquidity or other private asset return premium increases the discount rate (reducing the contribution of future

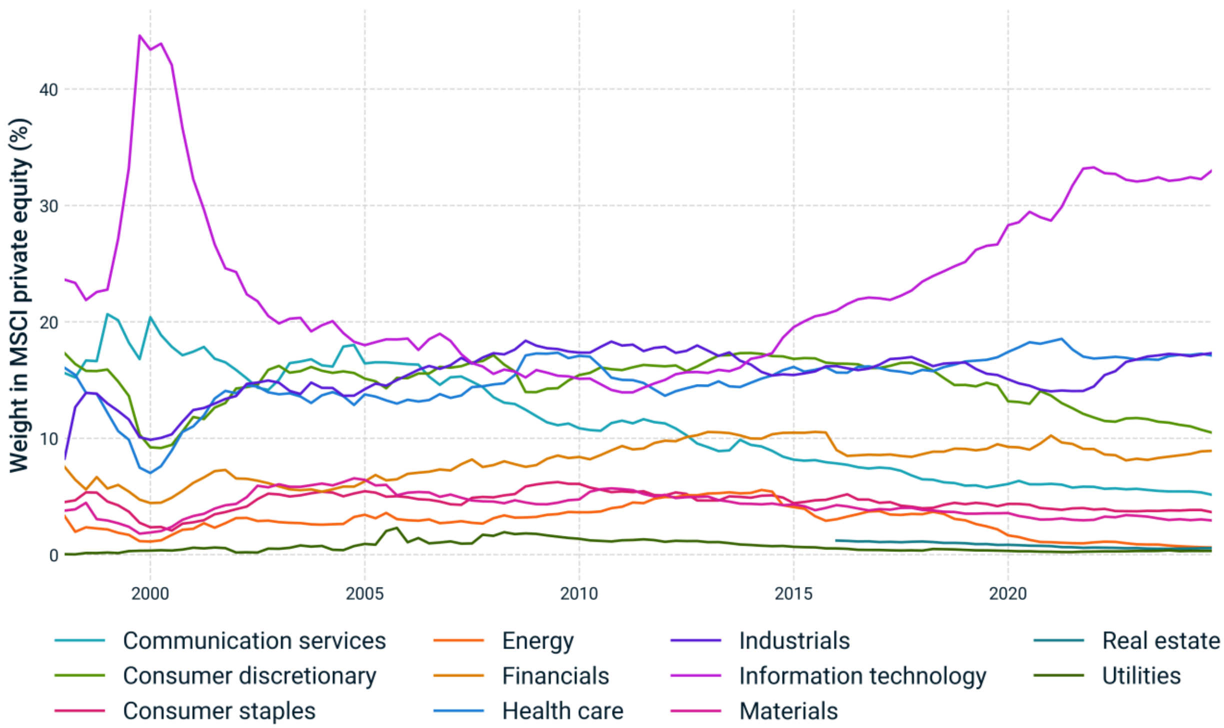
[4] Fee structures for closed-end funds vary widely, but typically GPs charge a fixed fee (often around 2%) on committed capital, and receive a fraction of ownership in the fund (carried interest, or carry) for returns above some specified hurdle rate, often about 8%.

cashflows to the present value). These effects mostly offset, but result in a net effect of slightly reducing beta.

- **VC risk appetite**: The beta of VC is significantly amplified by a strong cyclicality in risk appetite. VC returns, multiples and exit activity tend to boom and bust with the risk-on/risk-off cycles of the market, contributing to an overall beta greater than one. We inform the beta prior for VC with a scaling factor estimated from its long-run market beta relative to all the above effects.
- **Other influences**: Other aspects of private equity may also influence beta. GPs may effectively reduce down-side beta by injecting capital to help firms ride out a downturn, for example, and they may tend to select lower-beta companies. The potential for such effects does not change our priors, but may contribute to differences between the prior and the time-series-based posteriors, as well as exposure to the low vol factor.

These contributions inform the prior for the exposure to the core index, with the exception of sector composition — which is reflected in the core index itself — and other influences, which are captured through the time series regression.

World private equity sector allocations



The sector allocations of private equity have evolved, as have the betas of the sector constituents, and private equity has not been as tilted toward low-beta sectors as some have assumed. MSCI data from 1998 through 2024.

Fundamental factor exposures

Exposures can be built up from fundamental data to reflect private equity's characteristics relative to the public market. Positive (negative) exposures reflect greater (lower) levels of a characteristic compared to the core index.

Growth

The most important characteristic differentiating private equity — including buyouts and especially venture and growth capital — is growth. We define growth as $(EBITDA_{t+1} - EBITDA_t)/(.5 \cdot |EBITDA_{t+1}| + .5 \cdot |EBITDA_t|)$. Smoothing out the denominator by averaging the beginning- and end-of-period EBITDA helps reduce noise outliers.

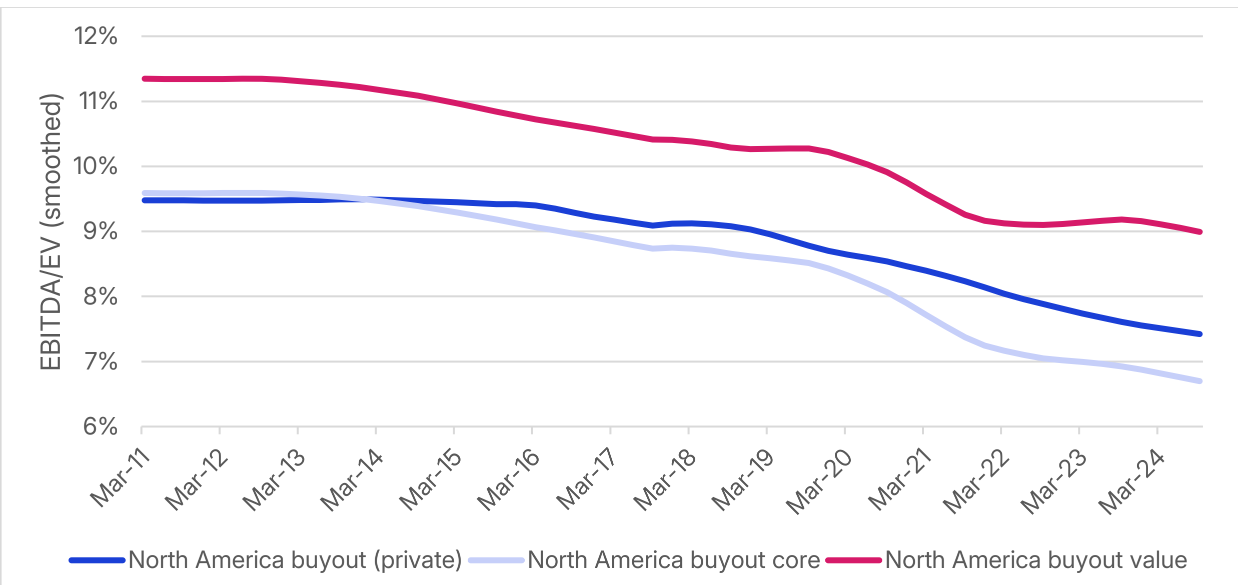
Leverage

Leverage exposure is defined from the $Enterprise\ Value/Equity$ leverage ratio. Relative to the public markets, buyouts tend to have positive — though diminishing — exposure, and ventures negative exposure, reflecting venture's lower leverage compared to public counterparts.

Value

Buyout firms typically target companies with strong operating profitability relative to their valuation, aiming to acquire assets at attractive prices while ensuring sufficient cash flow to support increased leverage. We define value exposures from the $EBITDA/Enterprise\ Value$ ratio.

Value exposure from the EBITDA-to-enterprise-value ratio



The EBITDA to enterprise value ratio, which is similar to earnings yield, has been higher for North American buyouts than the corresponding core index, indicating a positive value exposure. Recently, the excess EBITDA/EV of North American buyouts has been about a third of the corresponding value factor index, resulting in an exposure prior of about 0.3.

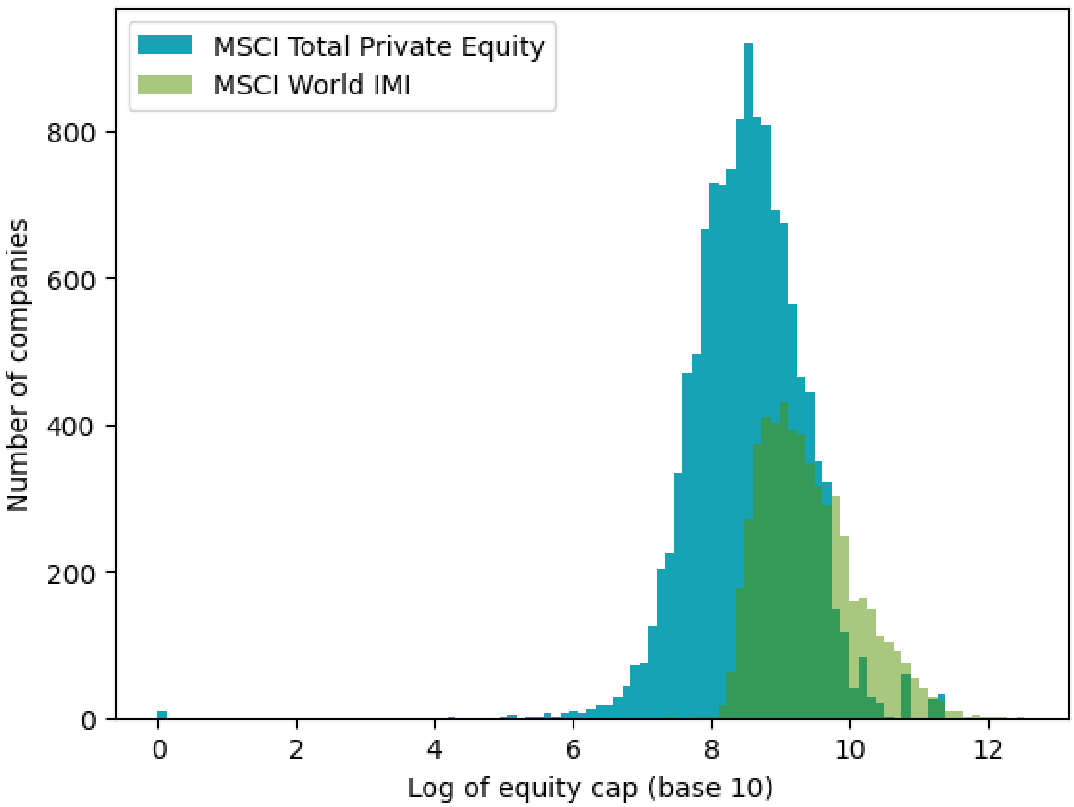
Low size

The size factor reflects the return of small companies relative to large companies. Small companies have positive exposure and large companies have negative exposures.

Since size can range from millions to trillions, size factor exposures can't simply be linearly proportional to the value of a company. A 1% return to size doesn't cause a trillion-dollar company to move 1000 more than a billion-dollar company.

We define size factor exposures from the logarithm of market capitalization, so a company valued at USD 1 trillion = USD 10^{12} is scored 12, and a billion-dollar company (USD 10^9) is scored 9, and so on, before shifting and scaling relative to the core public market index.

Public and private company size distributions on a logarithmic scale



The range of company size varies over more than six orders of magnitude. A (base 10) logarithmic scale results in more normally distributed exposures. Private equity has a significant low size tilt relative to public equity, though unicorns and delayed exits have added to the right tail. MSCI data as of September2024.

Low vol and momentum

We do not have fundamental-data based priors for low vol and momentum factor exposures — their priors are set to zero — but the return-based regressions result in non-zero posterior exposures to these factors.

Buyout exposure to low vol (a strategy that minimizes portfolio-level volatility by tilting to low-beta and low-volatility stocks) is consistent with a tendency for buyouts to target more stable companies.

Private equity exposure to momentum may seem counterintuitive based on its mechanical definition as a technical market factor, but momentum reflects trend-following strategies and delayed pricing of assets, both of which play roles in private equity.

Fundamental data treatment

To address noise and lags in the fundamental private equity data, all descriptors are smoothed with exponentially weighted moving averages. To provide a history before the availability and breadth of fundamental data, priors are backfilled by applying a two-sided exponential moving average, which transitions to a backward-looking average after 2020.[5]

To construct an investible index, small-cap allocations are reduced by capping low size exposure, and factor exposures are floored at zero for all factors other than leverage.

The breadth of private equity data coverage varies globally, and fundamental data for the Pacific region in particular is still quite thin. We shrink priors for this region toward counterparts in North America and Europe & Middle East.

Step 3: Translating factor exposures to index allocations

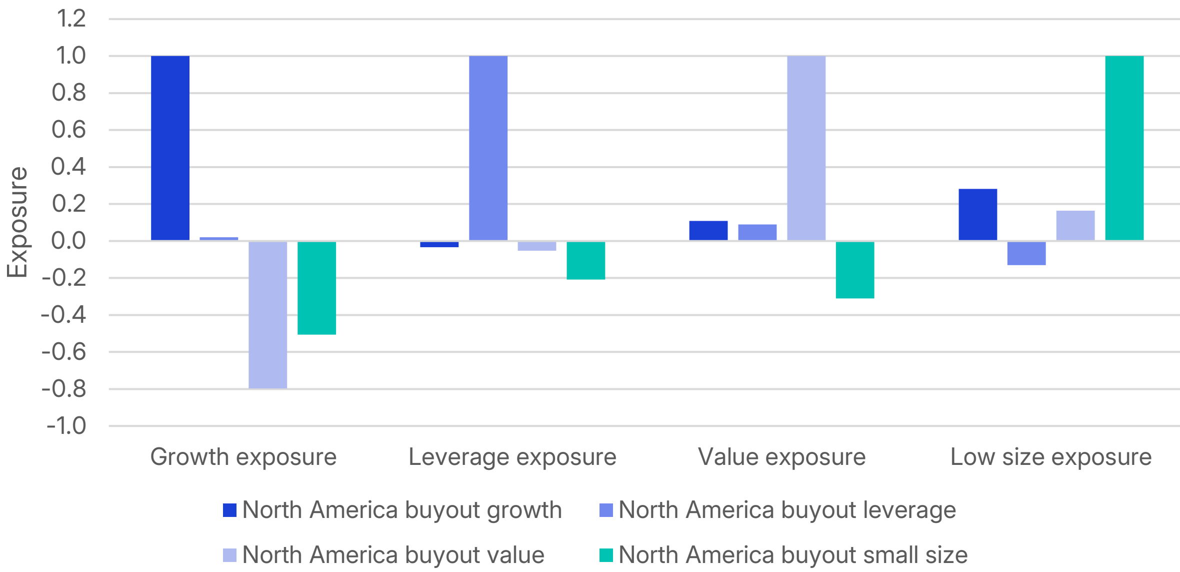
The building block indexes are not pure factors, so exposure to each brings an admixture of exposures to other factors. We need to translate the target pure factor exposures into allocations across the representative indexes. For example, the growth index comes with a significant small cap exposure, so allocations to the low size index are smaller to offset the small cap exposure that arises through allocations to the growth index.[6]

Mathematically, if the matrix element X_{kn} denotes the exposure of style index n to factor k, and the vector Y_k represents the target factor exposure, then the target index allocation is $W = X^{-1}Y$. Setting priors W for index allocations is equivalent to setting prior factor exposures Y.

[5] Growth data is especially noisy, requiring a longer half-life.

[6] Imagine a recipe calls for a teaspoon of salt and a cup of unsalted butter, but we're using salted butter. Fortunately, we know how much salt is in the butter, so we can work out how much less salt to add on top of what comes with the butter.

Building-block factor index pure factor exposures



Investible factor indexes represent tilts toward each corresponding factor, but not pure factor exposures, so each brings exposures to other factors. We account for these mixed exposures in translating fundamental data to factor index allocation priors. MSCI data as of September 2024.

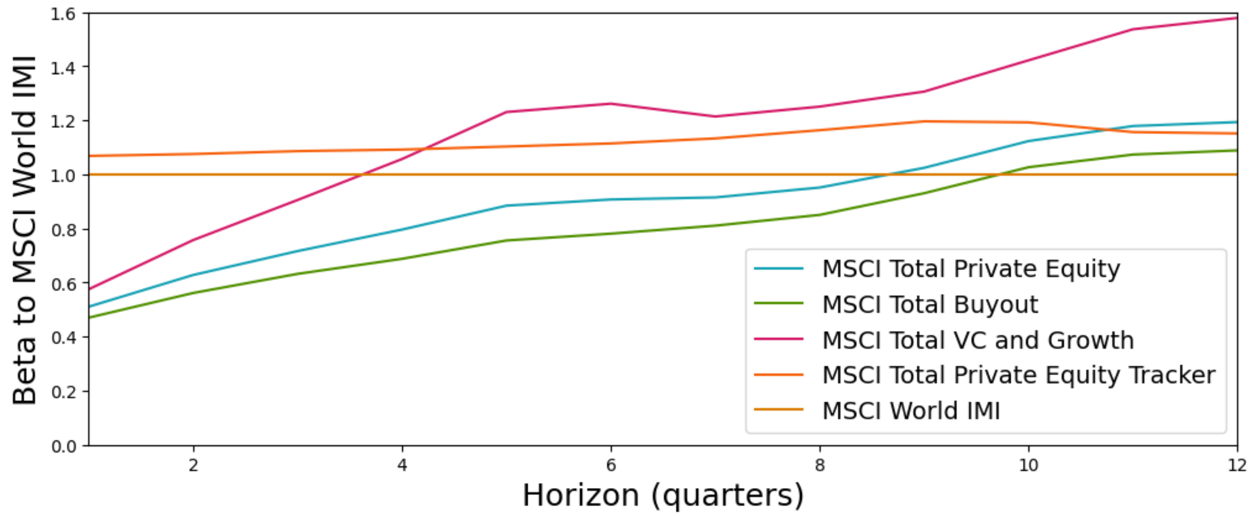
Step 4: Bayesian regressions

If there were perfect information on exposures aggregated up from the deal level, we could just use that… but it doesn't exist. If sensitivities from time-series regressions had high signal-to-noise, we could just use those… but they don't. Our Bayesian framework enables a robust best-of-both, combining MSCI's unique, deal-level fundamental data set with time-series-based sensitivities to produce factor index allocations.

Time-series regressions with private asset data are especially difficult because of the smoothness and low frequency of private asset valuations. The low frequency increases noise by reducing the number of data points, but the smoothness is even more difficult, potentially leading to highly inaccurate sensitivities.

Regressions directly on quarterly returns could suggest that taking a company private with a leveraged buyout *reduces* systematic risk by about half, despite the added leverage. Regressions on longer horizons show this is clearly an artefact of the smooth data, as betas increase with horizon. But using longer horizons further reduces the number of independent data points and increases noise, and there is simply not enough data to directly estimate sensitivities at the long horizons at which objective cashflows and transaction prices can be used instead of subjective intermediate valuations.

Smooth valuations mask large systematic risk in private equity



Estimated directly from the data — without any desmoothing or priors — the beta of private equity is low at a quarterly horizon, but increases above one at a longer horizon. MSCI data as of September 2024.

Various approaches have been put forward to address the smoothness of valuation data. Geltner (1993) introduced a desmoothing approach, which assumes a first-order autoregressive (AR(1)) smoothing process that can be exactly inverted to infer a time-series of "true" returns that can be used in regressions. Our research (Shepard, 2014) found Geltner's approach to be a very useful step, especially when applied atop an annual data horizon (to avoid the seasonality of valuation smoothness) and broad aggregates across many deals and funds. But the AR(1) model is… only a model. It is a reasonable approximation of the smoothness in valuations at a broad segment level, but not at more granular fund- or deal-levels. And the assumption that the level of smoothing is a known constant — upon which the invertibility to "true" returns rests — introduces systematic downward biases in regression sensitivity estimates.

To deal with these challenges, we introduced a Bayesian desmoothing framework that is the basis of MSCI's industry-standard private asset risk models. The model estimates exposures as:

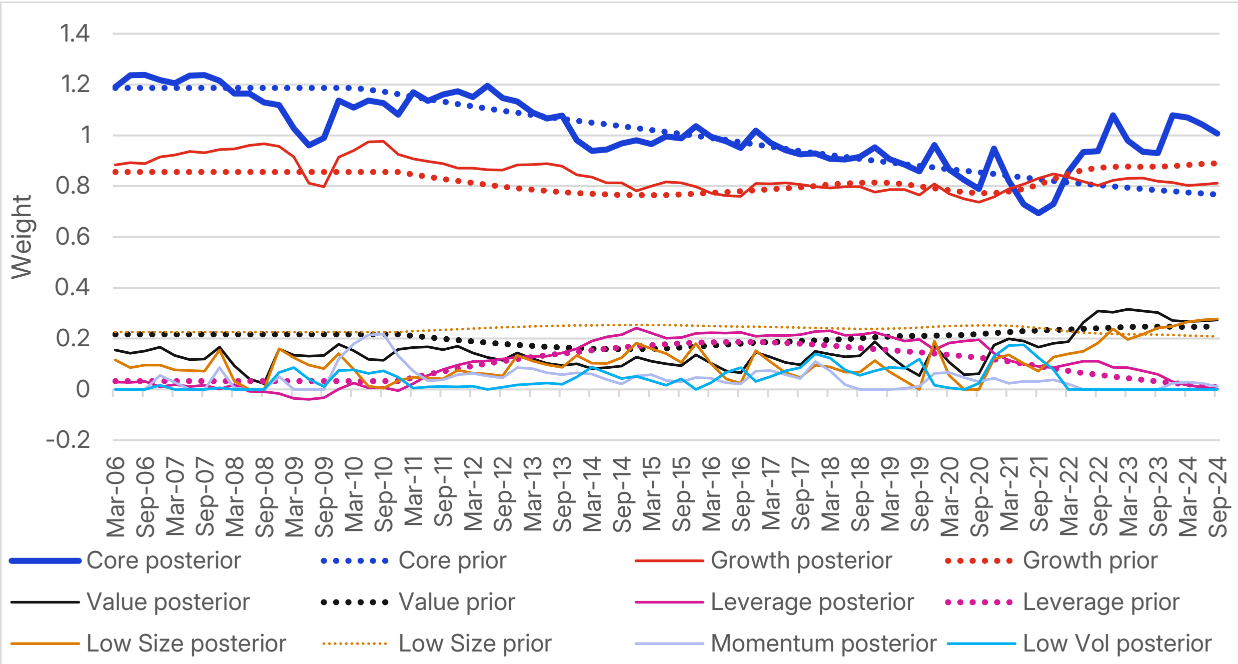
$$Expected(exposure|priors,\ returns,\ smoothing\ dynamics)$$

The priors allow the incorporation of other information beyond the returns, and control noise. The Bayesian desmoothing also accounts for uncertainty in the smoothing dynamics by estimating exposures with an average (posterior probability-weighted) over smoothing dynamics.

In simulation studies of the accuracy of various estimators under a wide range of simulated "true" smoothing dynamics, our Bayesian approach was significantly more accurate, and avoided a downward bias seen in other approaches, including Geltner desmoothing.

This Bayesian approach becomes significantly more powerful with the incorporation of fundamental data for a broad universe of private equity deals. With this data informing the priors, we're able to estimate exposures to style factors — especially growth — which are important drivers of long-run returns, but insufficiently volatile to estimate from returns-based regressions alone. The style exposures can also be expressed in terms of factor index allocations, as shown in the chart below.

North America buyout factor index allocations



Factor allocations are estimated with priors informed from the fundamental data, transformed to reflect the mixed exposures of investable factor indexes, and updated with robust, desmoothed time-series regressions.

Conclusions

Whether the performance of private equity is driven more by “private” or “equity” has been a contentious question, with answers more often driven by opinion than by data. Transparency from MSCI’s fundamental private-asset data set shows the role of both.

Indexes constructed to match the fundamental characteristics of private equity explain significant components of its performance, and support accessible and liquid investment products that replicate some of its characteristics.

These benchmarks also help demonstrate how private equity has added value beyond public-market counterparts. Even after controlling for leverage, other fundamental characteristics and fees, private equity has outperformed public equity.

References

Geltner, David. "Estimating Market Values from Appraisal Values without Assuming an Efficient Market," Journal of Real Estate Research, 8(3): 345-352, Summer 1993.

MSCI. "MSCI World Private Equity return Tracker Index Methodology." Index Methodology, July 2025.

Phalippou, Ludovic. "An Inconvenient Fact: Private Equity Returns & The Billionaire Factory." University of Oxford, Saïd Business School Working Paper, June 2020.

Shepard, Peter, and Ying Liu. "The MSCI Private Equity Model." MSCI Research Insights, August 2014.

Contact us

About MSCI

MSCI is a leading provider of critical decision support tools and services for the global investment community. With over 50 years of expertise in research, data and technology, we power better investment decisions by enabling clients to understand and analyze key drivers of risk and return and confidently build more effective portfolios.
We create industry-leading research-enhanced solutions that clients use to gain insight into and improve transparency across the investment process.

To learn more, please visit www.msci.com.

msci.com/contact-us

AMERICA

United States	+ 1 888 588 4567 *
Canada	+ 1 416 687 6270
Brazil	+ 55 11 4040 7830
Mexico	+ 52 81 1253 4020

EUROPE, MIDDLE EAST & AFRICA

South Africa	+ 27 21 673 0103
Germany	+ 49 69 133 859 00
Switzerland	+ 41 22 817 9777
United Kingdom	+ 44 20 7618 2222
Italy	+ 39 02 5849 0415
France	+ 33 17 6769 810

ASIA PACIFIC

China	+ 86 21 61326611
Hong Kong	+ 852 2844 9333
India	+ 91 22 6784 9160
Malaysia	1800818185 *
South Korea	+ 82 70 4769 4231
Singapore	+ 65 67011177
Australia	+ 612 9033 9333
Taiwan	008 0112 7513 *
Thailand	0018 0015 6207 7181 *
Japan	+ 81 3 4579 0333

* toll-free

Notice and disclaimer

This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the "Information") is the property of MSCI Inc. or its subsidiaries (collectively, "MSCI"), or MSCI's licensors, direct or indirect suppliers or any third party involved in making or compiling any Information (collectively, with MSCI, the "Information Providers") and is provided for informational purposes only. The Information may not be modified, reverse-engineered, reproduced or redisseminated in whole or in part without prior written permission from MSCI. All rights in the Information are reserved by MSCI and/or its Information Providers.

The Information may not be used to create derivative works or to verify or correct other data or information. For example (but without limitation), the Information may not be used to create indexes, databases, risk models, analytics, software, or in connection with the issuing, offering, sponsoring, managing or marketing of any securities, portfolios, financial products or other investment vehicles utilizing or based on, linked to, tracking or otherwise derived from the Information or any other MSCI data, information, products or services.

The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. NONE OF THE INFORMATION PROVIDERS MAKES ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EACH INFORMATION PROVIDER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.

Without limiting any of the foregoing and to the maximum extent permitted by applicable law, in no event shall any Information Provider have any liability regarding any of the Information for any direct, indirect, special, punitive, consequential (including lost profits) or any other damages even if notified of the possibility of such damages. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited, including without limitation (as applicable), any liability for death or personal injury to the extent that such injury results from the negligence or willful default of itself, its servants, agents or sub-contractors.

Information containing any historical information, data or analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction. Past performance does not guarantee future results.

The Information may include "Signals," defined as quantitative attributes or the product of methods or formulas that describe or are derived from calculations using historical data. Neither these Signals nor any description of historical data are intended to provide investment advice or a recommendation to make (or refrain from making) any investment decision or asset allocation and should not be relied upon as such. Signals are inherently backward-looking because of their use of historical data, and they are not intended to predict the future. The relevance, correlations and accuracy of Signals frequently will change materially.

The Information should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. All Information is impersonal and not tailored to the needs of any person, entity or group of persons.

None of the Information constitutes an offer to sell (or a solicitation of an offer to buy), any security, financial product or other investment vehicle or any trading strategy.

It is not possible to invest directly in an index. Exposure to an asset class or trading strategy or other category represented by an index is only available through third party investable instruments (if any) based on that index. MSCI does not issue, sponsor, endorse, market, offer, review or otherwise express any opinion regarding any fund, ETF, derivative or other security, investment, financial product or trading strategy that is based on, linked to or seeks to provide an investment return related to the performance of any MSCI index (collectively, "Index Linked Investments"). MSCI makes no assurance that any Index Linked Investments will accurately track index performance or provide positive investment returns. MSCI Inc. is not an investment adviser or fiduciary and MSCI makes no representation regarding the advisability of investing in any Index Linked Investments.

Index returns do not represent the results of actual trading of investible assets/securities. MSCI maintains and calculates indexes, but does not manage actual assets. The calculation of indexes and index returns may deviate from the stated methodology. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the index or Index Linked Investments. The imposition of these fees and charges would cause the performance of an Index Linked Investment to be different than the MSCI index performance.

The Information may contain back tested data. Back-tested performance is not actual performance, but is hypothetical. There are frequently material differences between back tested performance results and actual results subsequently achieved by any investment strategy.

Constituents of MSCI equity indexes are listed companies, which are included in or excluded from the indexes according to the application of the relevant index methodologies. Accordingly, constituents in MSCI equity indexes may include MSCI Inc., clients of MSCI or suppliers to MSCI. Inclusion of a security within an MSCI index is not a recommendation by MSCI to buy, sell, or hold such security, nor is it considered to be investment advice.

Data and information produced by various affiliates of MSCI Inc., including MSCI ESG Research LLC and Barra LLC, may be used in calculating certain MSCI indexes. More information can be found in the relevant index methodologies on www.msci.com.

MSCI receives compensation in connection with licensing its indexes to third parties. MSCI Inc.'s revenue includes fees based on assets in Index Linked Investments. Information can be found in MSCI Inc.'s company filings on the Investor Relations section of msci.com.

MSCI ESG Research LLC is a Registered Investment Adviser under the Investment Advisers Act of 1940 and a subsidiary of MSCI Inc. Neither MSCI nor any of its products or services recommends, endorses, approves or otherwise expresses any opinion regarding any issuer, securities, financial products or instruments or trading strategies and MSCI's products or services are not a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such, provided that applicable products or services from MSCI ESG Research may constitute investment advice. MSCI ESG Research materials, including materials utilized in any MSCI ESG Indexes or other products, have not been submitted to, nor received approval from, the United States Securities and Exchange Commission or any other regulatory body. MSCI ESG and climate ratings, research and data are produced by MSCI ESG Research LLC, a subsidiary of MSCI Inc. MSCI ESG Indexes, Analytics and Real Estate are products of MSCI Inc. that utilize information from MSCI ESG Research LLC. MSCI Indexes are administered by MSCI Limited (UK) and MSCI Deutschland GmbH.

Please note that the issuers mentioned in MSCI ESG Research materials sometimes have commercial relationships with MSCI ESG Research and/or MSCI Inc. (collectively, "MSCI") and that these relationships create potential conflicts of interest. In some cases, the issuers or their affiliates purchase research or other products or services from one or more MSCI affiliates. In other cases, MSCI ESG Research rates financial products such as mutual funds or ETFs that are managed by MSCI's clients or their affiliates, or are based on MSCI Inc. Indexes. In addition, constituents in MSCI Inc. equity indexes include companies that subscribe to MSCI products or services. In some cases, MSCI clients pay fees based in whole or part on the assets they manage. MSCI ESG Research has