BENCHMARKING PRIVATE EQUITY

ARE US PENSION PLANS PERFORMING AS POORLY AS THEIR BENCHMARKS SUGGEST?

September 2025

Executive Summary

US Plans Benchmarking Choices. We evaluate the benchmarking choices and recent returns for ten US public pension plans of varying sizes, ranging from $15 billion in assets to over $500 billion. With the perceived weak performance of private equities, many pension plans' private equities returns are lagging materially behind public market proxies. This suggests either across the board underperformance – or – that the benchmark choices may be incorrect. The most common benchmark choice among the 10 US Public Plans was the Russell 3000 index plus a spread, followed by the S&P 500 plus a spread. Just two of the ten funds sample used a private equity related benchmark.

Recent Private Equities' Returns. The return profile of the ten plans since 2020 is rather similar. Exceptionally high returns in 2021 (median of group = 50.8%!), followed by strong median returns in 2022 of 22.4%. After the exuberance of 2021/22, median returns dropped to minus 1.8% in 2023, and 6.5% in 2024. While listed markets had a steep correction in 2022, then very strong performance in 2023 and 2024, the NAV market in private equities did not give back much of its earlier gains and is instead in a period of reduced exit activity and muted returns. This is one challenge of benchmarking with listed indices, as the markets can behave quite differently, concealing performance information.

We previously wrote about similar benchmarking issues at Canadian pension plans (see here).

Private2000® Index. In comparison to the listed equities benchmarks, the private2000 index captured the recent environment much better. Comprised of asset level private equities, rather than private equity funds, the index is more representative of current market conditions in private equities. By capturing new transactions and re-pricing monthly, the index reflects current pricing dynamics in the market. This shows up in results. **In 2023, the private2000 index returned 0.6% (vs median of minus 1.8% for plans).** The S&P 500 was up over 20% for the same period. 2024 is much the same. **The private2000 index was up 4.5% vs a median return of 6.5% for the pension plans,** and over 25% for the S&P 500. Returns for the Russell 3000 and MSCI ACWI were similar. When benchmarked against the private2000 index, the returns of the US plans studied look very much in line with the market. Comparing them to listed benchmarks, where they show 20% underperformance for consecutive years, provides little insight into performance.

Data and Methods

We collected data from ten US public pension plans, ranging in size and by region, directly from their Annual Reports. The pension plans included some of the largest plans, such as CalPERS and CalSTRS, and smaller and mid-market plans like Michigan SERS, New Jersey Teachers, and Iowa PERS. Table 1 details a list of the pension plans evaluated, their most recent plan assets, and current and target allocation to private equity.

Performance and benchmark return data was gathered covering at least 10 years for all the plans, while focusing on the most recent 5 years. Further, we documented some changes in benchmark choice during the period. Returns for plans are time weighted.

All plans have relatively mature private equity portfolios, with current allocations to private equity ranging from 8.7% to 26.5% of plan assets.

TABLE 1: KEY STATS OF US PENSION PLANS

Private Equity Returns	Plan Assets	PE Allocation	PE Target Alloc.
NY State Teachers	$145Bn	9.9%	9%
NJ Teachers	$32Bn	11.0%	13%
Calpers	$558Bn	14.0%	17%
Calstrs	$374Bn	15.5%	14%
Florida RS	$205Bn	9.3%	11%
Michigan SERS	$15Bn	21.1%	16%
Iowa PERS	$41Bn	18.4%	17%
Colorado PERA	$62Bn	8.7%	8.5%
NYC ERS	$92Bn	10.7%	10%
Oregon PERS	100Bn	26.5%	20%

Source: Annual Reports. Public Plans Data. FYE is June 30. Michigan SERS FYE is September 30, while Colorado State is December 31.

Their annual private equity returns were compared against disclosed benchmark returns. We then introduced the flagship privateMetrics® indices (see: here) to benchmark plan returns. The private2000® index pricing dates to June 2013, so plan returns were measured against the various benchmarks since that time. The monthly index prices and time weighted returns can be pulled into excel using the Excel Add In tool. More details on our MS Excel Add-in is available (here) with documentation available (here).

The private2000® index is an asset level private equities index comprised of the largest 2,000 companies in the privateMetrics® database, controlling for country and sector allocations. The index is constructed to reflect the private equities market, with geographic and industry weights that align with the private equity universe. Importantly, the index prices more frequent (monthly) than the quarterly reporting observed from GPs, addressing the stale NAV issue. The asset pricing model used to price individual constituents incorporates factor exposures unique to the private equities market, including size, leverage, profitability, growth, and maturity. Further, by capturing and incorporating recent transaction data, the asset prices reflect the most recent pricing dynamics in the market, providing a more accurate view of the broad private equities market. As the index reflects systematic risk (not individual manager bets or concentrated private equity funds), it is ideally suited to benchmark diversified private equity portfolios. More detail on the asset pricing model, PECCS® taxonomy, and country/sector weights is available in the appendix.

Benchmarking Choices

Table 2 outlines the benchmarking choices of ten US State pension plans sourced from their most recent annual reports and the Public Plans Data database[1]. The majority of plans use a listed equities benchmark plus a fixed spread. Just two of the ten pension plans included a private equity (fund manager) benchmark as part of their composite.

TABLE 2: BENCHMARKING PRACTICES FOR SELECT US STATE PENSION PLANS

Pension Fund	Benchmarking Practice
NYSTRS	Current: S&P 500 + 500 bps Last change: Not since 2001 (first year of data collected)
New Jersey Teachers	Current: Cambridge Associates (pooled IRR) Last change: 2010 (S&P 1000 + 300 bps)
CalPERS	Current: FTSE All World, All Cap + 150bps (1 Quarter Lag) Last Change: 2022 (67% FTSE USTMI+ 33 FTSEAWEXUS +3% (1Q Lag)
CalSTRS	Current: Custom SSPEI Index (TWRs) for 1, 3, 5 years. Longer term benchmark is `MSCI. Last Change: 2022 (Custom Index weighted based on sub-asset allocation targets)
Florida RS	Current: Russell 3000 + 300 bps Last change: 2010 (Russell 3000 + 450 bps)
Michigan SERS	Current: S&P 500 + 300 bps (1 Qtr lag) Last change: 2021 (S&P 500 + 300bps)
Iowa PERS	Current: Russell 3000 Last Change: 2023 (Wilshire 5000 + 300 bps)
Colorado PERA	Current: MSCI ACWI IMI + 150 bps Last Change: 2019 (Burgiss TWR)
NYCERS	Current: Russell 3000 + 300 bps (1 Qtr lag) Last Change: Not since 2014
Oregon PERS	Current: Russell 3000 + 300 bps Last Change: 2006 (Russell 3000 + 500 bps)

Source: Annual Reports. Public Plans Data.

The characteristics of listed equities' indices are not representative of the private equities market, making them unsuitable to benchmark private equity portfolios. A number of striking differences among the disclosed benchmarks are listed below:

[1] Public Plans Data | Public Plans Data

- **The S&P 500 has mean and median market capitalisations of $115Bn and $38Bn.** Further, the index is top heavy, with the top ten accounting for 38% of index. To put this in perspective, **the mean market cap of the top 10 constituents is $2.2 trillion**. The mean deal size in private equities is just over $700 million (privateMetrics). The smallest member of the S&P 500 has a market cap over $5 billion.
- **The Russell 3000 is broader** than the S&P 500 **but still has mean and median market capitalisations of ~ $20Bn and $2.3Bn**, significantly larger than the private equities market.
- Broader still is the MSCI ACWI index. Mean and Median market caps $11.8 billion and $1.5 billion, with the top 10 accounting for 21% of the index. **Even this index is still driven by its tech heavy top 10 constituents, all with trillion dollar market caps**.
- In comparison, the private2000 index, which tracks 2000 private equities globally, has a mean and median market capitalisation of $954 million and $158 million, respectively. This aligns very well with the actual mean deal size in the private equities market. The largest constituent has a market cap of $13 billion, compared with multi-trillion market caps in listed equities. Most private equity deals would be considered micro or small cap by listed equities standards.

Recent Plan Private Equity Returns

Table 3 details the annual private equity returns since 2020 for the same ten US pension plans. Return trends and levels by year are similar across the plans. In 2020, returns were low, with median returns of just 2.6%. The one outlier, Colorado PERA, has a December 31 year-end date (vs June 30 for the others), thus capturing some of the rebound that other plans experienced in their FY 2021. The magnitude of the frothiness with the Covid stimulus and rate cuts is capture in the 2021 returns, where the median plan return for the year was 50.8%. This largely continued into 2022. For the last two years, returns have remained low, with negative median returns in 2023 and mid-single digit returns in 2024.

The return profile of these funds shows how slow GP NAVs adjust to market realities. After such explosive returns in 2021/22, one would have expected that the subsequent inflation shock and 400bps increase in US 10 yr treasury yields would have impacted valuations more than they did. But returns have flatlined, rather than corrected for overvaluation. This contrasts with listed equities, which had a large down year in 2022 (~20%) and subsequently rebounded strong in 23/24.

As we will show in the next section, the returns of the chosen benchmarks diverged greatly from those achieved in the private equity returns of these pension plans. This makes it difficult to determine whether how these plans performed. In Table 3, the private2000 USD VW index returns are included. This provides a better measuring stick for private equities portfolios.

TABLE 3: ANNUAL PRIVATE EQUITY RETURNS FOR SELECT US STATE PLANS

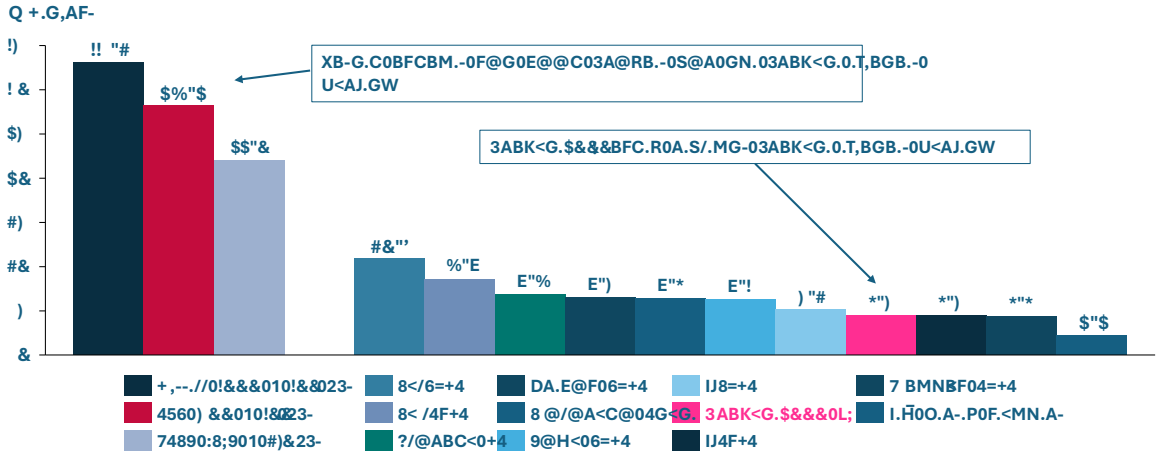
Private Equity Returns	2020	2021	2022	2023	2024
NY State Teachers	4.3%	59.0%	4.6%	5.8%	4.5%
NJ Teachers	0.2%	47.9%	6.2%	5.0%	2.2%
CalPERS	-5.1%	43.8%	21.3%	-2.3%	10.9%
CalSTRS	-0.1%	51.9%	23.8%	0.0%	8.6%
Florida RS	3.4%	67.9%	25.1%	-5.8%	6.8%
Michigan SERS	5.9%	54.1%	8.8%	-1.3%	4.4%
Iowa PERS	5.6%	68.3%	23.5%	-5.7%	6.3%
Colorado State	20.0%	39.6%	-6.7%	4.7%	6.4%
NYC ERS	1.8%	49.6%	25.2%	0.5%	5.1%
Oregon PERS	1.1%	44.1%	24.2%	-1.8%	6.5%
Median	2.6%	50.8%	22.4%	-1.8%	6.5%
Private2000 VW USD	6.4%	27.8%	-2.0%	0.6%	4.5%

Source: Annual Reports. Public Plans Data. FYE is June 30. Michigan SERS FYE is September 30, while Colorado State is December 31.

Plan Returns vs Benchmarks

In this section, we examine pension plan returns relative to both their commonly disclosed benchmarks (S&P 500, Russell 3000, MSCI ACWI) and the private2000® index. Using the latest reported results for 2024, we compare outcomes across the group of plans. When measured against listed equity indices, private equity appears to underperform sharply. However, when judged against the private2000, performance aligns closely with broader private market trends. Notably, nine of the ten plans posted single-digit returns, underscoring that 2024 was a generally weak year for the asset class. These results are summarised below.

FIGURE 1: 2024 RETURNS FOR PENSION PLANS VS 2024 SELECT BENCHMARK RETURNS



Source: privateMetrics, Annual Reports.

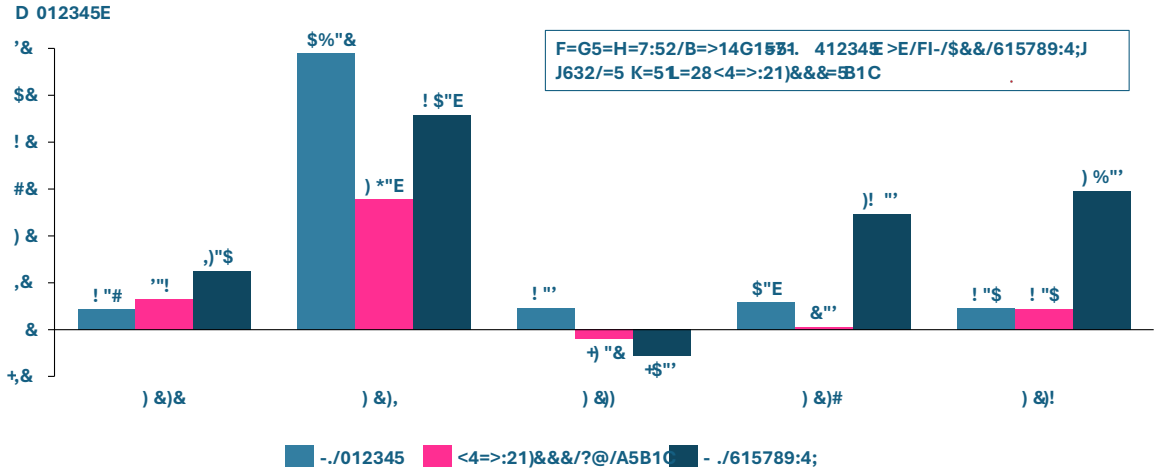
Next, we look at the annual returns vs benchmarks over the past 5 years for a number of plans that utilise different benchmarks. Figure 2 shows the annual private equity returns for NY State Teachers Retirement System (NYSTRS), their benchmark (S&P 500 + 500 bps), and the private2000 value weighted index.

The strength of the S&P 500 (benchmark) contrasts with the muted performance of the private equity portfolio. The 500bps spread on top of the S&P 500 only serves to add insult to injury. Post 2021 returns of NYSTRS' private equity portfolio diverged greatly from the S&P 500. This is especially the case in 2023 and 2024, where the benchmark was up 24.6% and 29.6%, respectively vs 5.8% and 4.5% for the private equity portfolio. Conversely, the private2000 index is more in line with weak recent returns of the plan.

Figure 3 shows a similar comparison for the Michigan State Employees Retirement System (Michigan SERS). Michigan SERS also uses the S&P 500 as a benchmark, with a 300 bps spread and 1 month lag. The story here is much the same, with diverging returns since 2021.

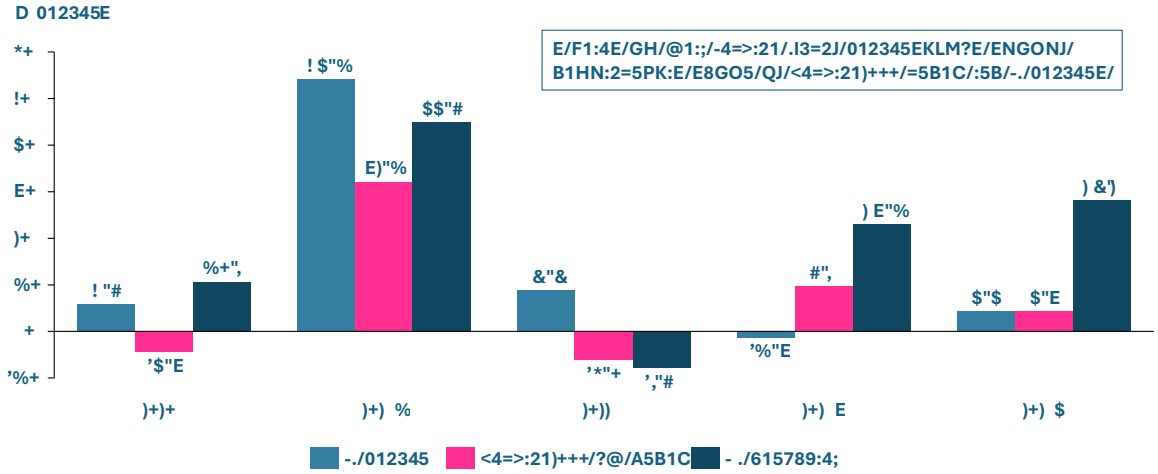
The S&P 500 is among the most loaded indices out there, representing the largest cap weighted companies in the US. The size and profile of the companies looks nothing like a typical private equity backed company. Table 4 shows key stats on S&P 500 companies compared to those in the private2000 index. The mean market capitalisation of the S&P 500 is more than 100x the mean market capitalisation of the private2000 index. The median company is over 200x the size, at $37.6 billion, vs just $158 million in private equities.

FIGURE 2: S&P 500 BENCHMARK: NY STATE TEACHERS RETIREMENT SYSTEM



Source: privateMetrics, Annual Reports. PE Benchmark = S&P 500 + 500 bps. FYE is June 30.

FIGURE 3: S&P 500 BENCHMARK: MICHIGAN SERS.



Source: privateMetrics, Annual Reports. PE Benchmark = S&P 500 + 300 bps (3 Mth lag). FYE is Sep 30.

Table 4: S&P 500 VS PRIVATEMETRICS – KEY CHARACTERISTICS

	Market Cap (USD $M)		Total Returns (%)		Valuation Multiple	
Index	**Mean**	**Median**	**1 Yr**	**3 Yr**	**P/S**	**P/E**
S&P 500	114,100	37,600	15.9	19.5	2.8x	25.9x
Private2000 VW	954	158	-8.2	0.2	1.1x	15.5x

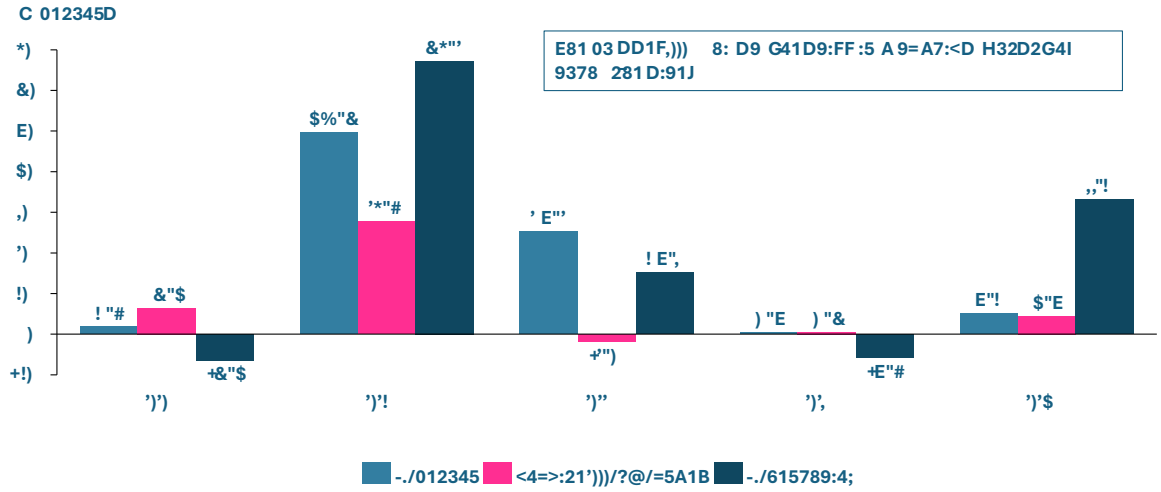
Source: privateMetrics. S&P 500 factsheet. July 2025

While the S&P 500 remains a popular benchmark choice, the most popular listed index employed is the Russell 3000. The Russell 3000 captures the largest 3000 US companies and designed to reflect upwards of 98% of the market. It’s a mix of the largest 1000 US companies, and the smaller and mid cap firms on the Russell 2000 index. Many institutions use this index as they feel it better matches the company characteristics of private equities. However, we will show this is not the case, as it remains top heavy. While much broader than the S&P 500, with a larger collection of small and midcap securities, it

is still meaningfully different than the private equities market. Four of the ten pension plans observed use the Russell 3000 index. One example is NYSERS.

Figure 4 examines the performance of NYSERS, from 2020 to 2024, measuring annual performance, the disclosed benchmark, and the private2000 index. Despite the different benchmark choice, listed markets remain quite disconnect from private equities over the last couple of years.

FIGURE 4: RUSSELL 3000 BENCHMARK: NYCERS



Source: privateMetrics, Annual Reports. PE Benchmark = RUSSELL 3000 + 300 bps (3 Mth lag). FYE is June 30.

Table 5 shows similar characteristics comparing the Russell 3000 to the private2000 value weighted index. Though the median company is much smaller ($2.27 billion) relative to the S&P, its still much large than the private equities equivalent ($158 million). Similarly, total returns and valuations have been driven by the larger end of the index and show characteristics that are very different than private equities. Moreover, as a cap weighted index, the performance of mega cap securities drives the index, and bears little in resemblance to the small firms in the private equities market.

Table 5: RUSSELL 3000 vs PRIVATEMETRICS – KEY CHARACTERISTICS

	Market Cap (USD $M)		Total Returns (%)		Valuation Multiple	
Index	Mean	Median	1 Yr	3 Yr	P/S	P/E
Russell 3000	19,500	2,270	15.8	18.8	3.0x	26.8x
Private2000 VW	954	158	-8.2	0.2	1.1x	15.5x

Source: privateMetrics. Russell 3000 factsheet. July 2025

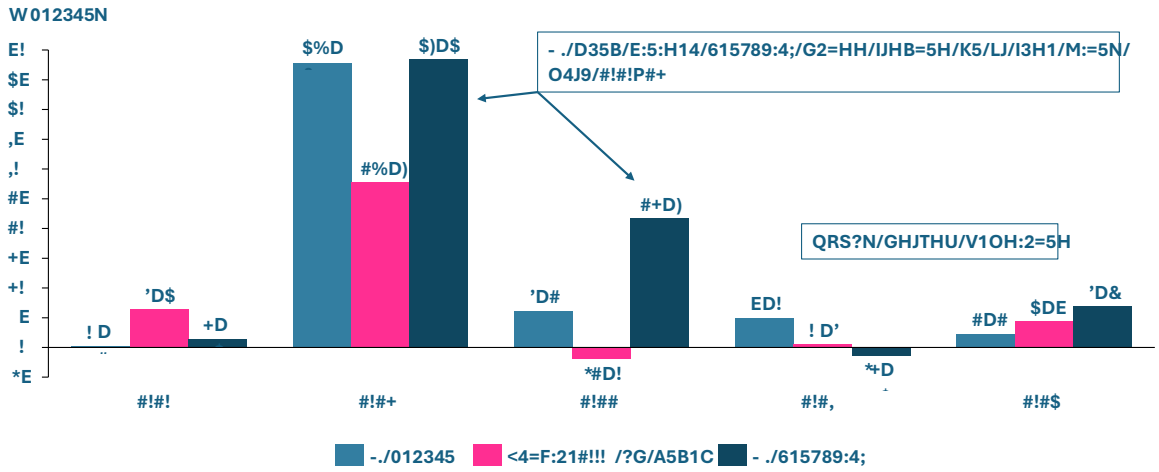
Though eight of ten public plans have listed equities' indices as benchmarks, two plans employ private equity fund manager benchmarks. New Jersey Teachers' uses Cambridge Associates pooled IRR, while CalSTRs benchmarks private equity with the State Streets private equity index, comprised of private equity funds. Fund manager benchmarks

introduce different issues than we observed with listed equities. Reported NAVs from GPs may not adjust rapidly enough (or at all) to reflect changing market conditions.

Moreover, there is a long delay in reporting. State Street's private equity index indicates that data is available 100 days after the GPs quarter end, making the data stale by the time it reaches the user. Both indices represent a large sample of fund managers performance, rather than a true index designed to capture the systematic risk of the market. In effect, they mix the market component of return (beta) with manager skill (alpha). An index should by definition reflect the market component. Finally, most of the fund manager benchmarks are IRR based. Institutions may choose listed equities benchmarks so that they can report time weighted returns, aligned with their other asset classes. The private2000 does not suffer from these issues as it provides time-weighted returns on a monthly basis (no lag).

Figure 5 shows returns of New Jersey Teachers Pension Plan against their private equity fund manager benchmark and the private2000 index. The Fund Manager based benchmark largely reflects the distributions and NAVs reported by GPs. The two-year gain in the benchmark during 2021/22 was substantial – over 70%. Returns have been weak since then but did not give back any of the prior gains. The private equity fund manager benchmarks slow adjustment impacts performance comparisons. Rather than re-price assets and reflect current private equities conditions, the recent benchmark returns may simply reflect a long hangover from the 2021/22 surge. The private2000 returns since 2021 show that the true NAVs may be significantly lower than the current marks.

FIGURE 5: PRIVATE EQUITY FUND MANAGER BENCHMARK: NEW JERSEY TEACHERS



Source: privateMetrics, Annual Reports. PE Benchmark = PE Fund Manager Benchmark. FYE is June 30.

Conclusion

The evidence across the ten US public pension plans makes clear that current benchmarking practices for private equity fail to reflect the private equities market, defeating the purpose of the benchmark. Comparing these outcomes to listed equity indices like the S&P 500 or Russell 3000 produces misleading signals and may impact asset allocation decisions. The structural differences between public markets and private equity portfolios—company size, valuation multiples, and the speed of price adjustments—mean that listed benchmarks are not reflective of private equities characteristics. Fund manager benchmarks introduce other issues, including significant reporting lags, smoothed valuations, and a mix of systematic risk and manager skill. By contrast, the private2000® index, by capturing systematic risk, pricing monthly, and updating for recent transactions, better reflects the return environment and provides more insight into manager and plan private equity performance. For trustees, beneficiaries, and policymakers, the lesson is straightforward: **if benchmarking is meant to be a tool for performance measurement and decision-making, it must reflect the market in which the assets are actually invested.** Adopting asset level private equities benchmarks would reduce confusion, align the private equity portfolio with a private equities benchmark, and ultimately improve asset allocation and performance discussions.

The privateMetrics^{Ò} Valuation Model

Our approach to the valuation of private companies is designed to maximise the available transaction and financial data in private markets and provide a standardised and systematic manner to update prices with every observed transaction.

First, we construct a multi-factor model of prices using a sample of observed transactions over time which can infer the unbiased and precise factor prices that investors pay for different characteristics of a private asset. Although every transaction is idiosyncratic or unique, in a large sample of transactions, the individual errors in each transaction price can be diversified away to discern the price attributable to each factor. Factor prices refer to the premium (or discount) that an investor is willing to pay to seek exposure to a specific factor of return in private companies. For example, observing the relationship between size and valuation among reported transactions, it can be inferred how much premium or discount an investor is willing to pay for purchasing a larger private company.

Second, an important and key application of this approach is that, with the estimated factor prices, say for size, it would then be possible to price unlisted private companies whose size information is available, irrespective of whether they are traded or not. This approach provides a more robust estimate for FV and enables the creation of representative indices of private companies.

Our approach's novelty is calibrating the model to newly observed transactions obtaining the factor price evolution over time, which allows us to update the valuation for all tracked unlisted private companies.

Common risk factors

If investors trade unlisted private companies from each other in mutually negotiated transactions, there must be some common characteristics that at least partially explain prices. For example, private companies that have higher profits or growth opportunities may be more valuable to investors than those that are not.

To arrive at a potential list of factors, we follow simple criteria that there needs to be an economic rationale for the factor to affect valuation. The factor should also be statistically related to the valuation. Moreover, the factor should also be objectively observable or measurable. With a potential list of factors, our factor selection is the result of a statistical approach, where the factors that can satisfactorily explain the variation in observed transaction valuations are included in the final model while trading off being parsimonious with being able to explain a higher variance in valuation. The privateMetrics asset pricing model uses five key risk factors as below:

- **Size**: Larger companies may be more complex, have higher transaction costs, and be less liquid, all of which can make them trade at a lower valuation per $ of revenue.
- **Growth**: As traditional PE strategies rely on growing the entry multiple, that may involve both increasing its top and bottom lines, i.e., revenue and profits. Thus, companies that can grow faster can be more sought after, making them more valuable.
- **Leverage**: Leverage can make a company riskier as it increases the risk of default. However, there is also a signaling effect of leverage, as companies with stable consistent cash flows can support a higher leverage, and vice versa. Thus, leverage is expected to influence the valuation of a company.
- **Profits**: More profitable companies have more predictable (less risky) future payouts and hence attract a lower risk premium, making them more valuable.
- **Maturity**: Younger companies have fewer track records and face higher information uncertainty. Studies have shown that firms with high uncertainty tend to be overvalued and earn lower future returns. Thus, the maturity negatively affects valuation.
- **Country risk**: Investors may require a high return when investing in a high-risk country, thus depressing the current valuation. In other words, in countries with lower risk, investors may be willing to purchase assets at a higher valuation as government policies may be more predictable with lower macroeconomic risks.

TABLE 1: KEY FACTORS, THEIR EFFECT ON VALUATION, & THE ECONOMIC RATIONALE FOR INCLUDING THEM IN THE MODEL

Factor	Definition (Proxy)	Effect on price	Economic Rationale	References
Size	Revenues	Negative	Larger firms are more illiquid and trade a lower price	Fama & French (1993)
Growth	Change in Revenues	Positive	Companies with higher revenue growth trade at a higher price	Fama & French (1992), Petkova & Zhang (2005)

Leverage	Total debt / Revenues	Positive	Companies that can borrow more have a lower cost of capital and a higher value	Gomes & Schmid (2010), George & Hwang (2010)
Profits	Ebitda Margin	Positive	Companies that have higher profits have a higher value	Novy-Marx (2013), Hou et al. (2015)
Maturity	Years since incorporation	Negative	Companies that are mature exhibit less growth potential and trade a at a lower price	Jiang et al. (2005)
Country Risk	Term Spread	Negative	Companies in high-risk countries face more uncertain prospects	Chen & Tsang (2013)

SOURCE: CALCULATED USING OVER 10K DEALS FROM PITCHBOOK, CAPITALIQ, FACTSET, AND OTHER PRIMARY SOURCES BETWEEN 1999-2022

Our factors have been documented in prior academic studies to be associated with valuation. We also include factors that have been identified as key determinants of valuation from a survey of private equity practitioners that we conducted in 2023. Table 1 summarises the key factors that we use in the model, how they are measured, each factor's effect we document in the data on average, the economic rationale for their inclusion, and citations for the work that underpins their inclusion.

Model set up

The privateMetrics asset pricing model uses the Price-to-Sales ratio of observable transactions (the entry price multiple) as the modelled variable. The model is estimated as the linear sum of the product of factor exposures and factor prices. The estimation can then separate the systematic part of the valuation while leaving out "noise" in each valuation. "

$$\widehat{P/S} = a + \sum_{!\#\$}^{} b_! l_! + e$$

Following standard asset pricing notation, the factor exposure or factor loading is called a beta (b), and the factor premium is called a lambda (l) for the k factors in the model. a is the intercept and e is the noise or idiosyncratic part of the valuation.

Model calibration

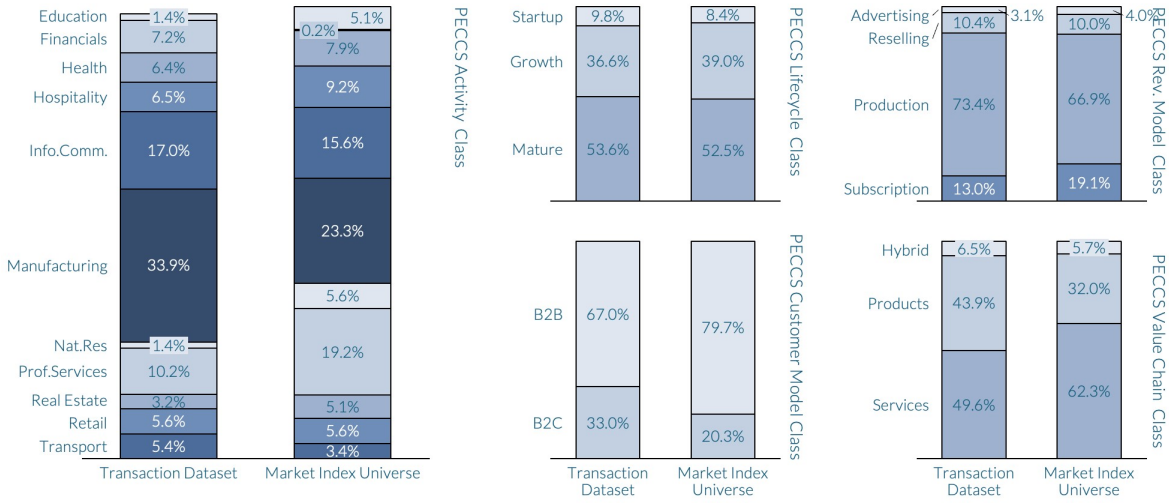
The privateMetrics model uses a carefully curated dataset of more than 10k+ unlisted private company investments going back two decades sourced from a wide variety of datasets including PitchBook, Factset, Capital IQ, fund manager reports, and other publicly available data sources.

We calibrate this model using new observations monthly to update its estimation of the price of risk of each factor. In other words, each transaction observed is then used to 'update' this model (i.e., obtain new ls) through a dynamic estimation (using a Kalman filter), which retains the memory of past ls while also allowing the new transaction to influence the relationship while keeping the average e close to zero. More details on the

implementation of the model are available in our online documentation and Selvam and Whittaker (2024). The dataset covers all key segments of the market as shown in Figure1.

A good application of using the model to value unlisted private companies is to create a representative marked-to-market index of private companies that are regularly valued. The privateMetrics index universe in Figure 1 includes the constituents of the private2000® index constructed by Scientific Infra & Private Assets, which is developed on this shadow pricing idea and captures the performance of private companies in 30 countries globally that are important for private equity investors (read more about the index here).

FIGURE 1: PRIVATEMETRICS TRANSACTION DATASET COMPARED TO THE PRIVATEMETRICS INDEX UNIVERSE BY PECCS PILLAR & CLASS



How precise are the predictions across PECCSÒ pillars?

To examine how closely the predicted valuations track the raw modelled valuations in transactions, we compute the average estimation errors of the full sample, and also by classes within each PECCS® pillar. What stands out is that although the model by design is expected to have lower estimation errors in the full sample, the within PECCS® class estimation errors are also very small. All the errors are within ±10%, reassuring that the model predictions on average even within each segment of PECCS® are reasonable. The errors are summarised in Table 5.

The most commonly used metric of valuation in private markets is EV/EBITDA as PE owners have the flexibility to alter the capital structure of their holding company and hence are more interested in operational profitability without factoring interest costs. However, our model is based on P/S because P/S is statistically better, stable, and not affected by loss-making companies. Thus, one may be concerned whether our predictions for EV/EBITDA might be biased.

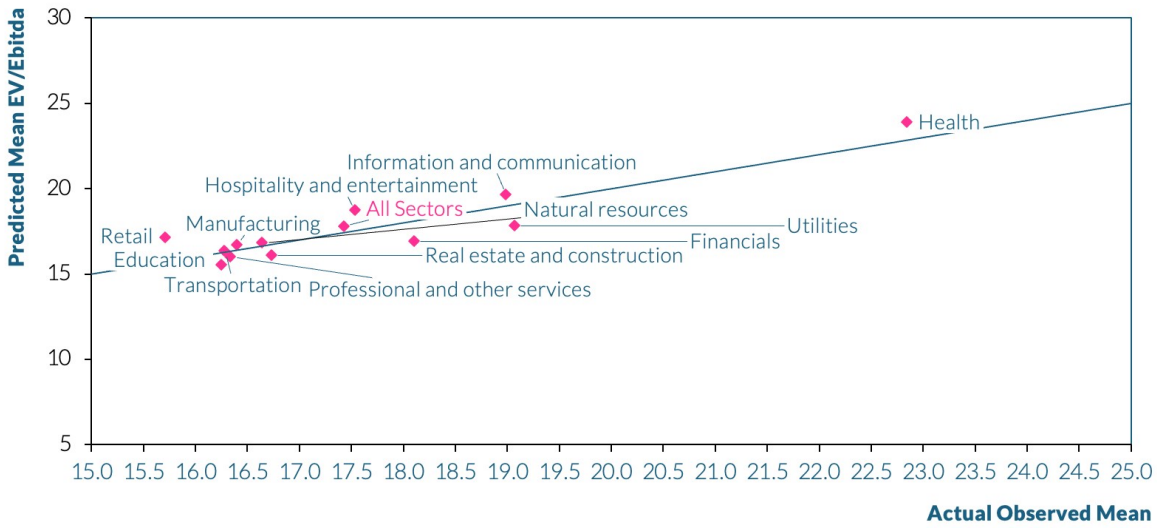
To ensure that is not the case, we compute the EV based on the book value of debt and predicted equity valuation and divide the sum by the EBITDA to get a predicted EV/EBITDA and compare it to transaction implied ratios. Figure 3 presents the average predicted and observed EV/EBITDA by PECCS® activity classes. We find that the predictions are very close to the observed values, thus mitigating this concern.

TABLE 5: AVERAGE ESTIMATION ERRORS ACROSS PECCS® CLASSES, BASED ON THE DIFFERENCE BETWEEN TRANSACTED VALUATIONS AND FACTOR MODEL PREDICTIONS

PECCS Pillar	PECCS Class	Mean Estimation Error	PECCS Class	Mean Estimation Error	PECCS Pillar
PECCS Activity	Education and public	0.9%	Startup	0.1%	PECCS Lifecycle Phase
	Financials	1.8%	Growth	-1.7%	
	Health	2.6%	Mature	2.8%	
	Hospitality and entertainment	-1.1%	Advertising	1.2%	PECCS Revenue Model
	Information and communication	-4.4%	Reselling	4.6%	
	Manufacturing	2.5%	Production	2.9%	
	Natural resources	9.4%	Subscription	-6.9%	
	Professional and other services	3.3%	B2B	1.5%	PECCS Customer Model
	Real estate and construction	1.9%	B2C	0.9%	
	Retail	0.5%	Hybrid	0.6%	PECCS Value Chain
	Transportation	7.2%	Products	1.1%	
Full Sample		**1.1%**	Services	3.4%	

SOURCE: CALCULATED USING OVER 10K DEALS FROM PITCHBOOK, CAPITALIQ, FACTSET, AND OTHER SOURCES BETWEEN 1999-2022

FIGURE 3: PREDICTED VERSUS ACTUAL EV/EBITDA RATIOS BY PECCS® ACTIVITY CLASSES



SOURCE: CALCULATED USING OVER 10K DEALS FROM PITCHBOOK, CAPITALIQ, FACTSET, AND OTHER SOURCES BETWEEN 1999-2022

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Our products come from the cutting-edge R&D of the EDHEC Infrastructure & Private Assets Research Institute, established in 2016 by EDHEC Business School. In 2019, we transformed this academic research into a commercial enterprise, providing services like private market indices, benchmarks, valuation analytics, and climate risk metrics. We take pride in our unique dual identity, bridging scientific research and market applications.

The EDHEC Infrastructure & Private Assets Research Institute (EIPA) continues to advance academic research and innovate with technologies in risk measurement and valuation in private markets, especially utilising artificial intelligence and language processing. Our company, Scientific Infra & Private Assets (SIPA), supplies specialised data to investors in infrastructure and private equity.

Merging academic rigor with practical business applications, our dedicated team excels in integrating quantitative research into private asset investing. Our products, infraMetrics® and privateMetrics®, are unique in the market, stemming from thorough research rather than being ancillary services of larger data providers. We are the Quants of Private Markets, leading with innovation and precision.

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