WHO HAS THE RIGHT BENCHMARK?

Is Canadian Pension Fund Private Equities Benchmarking Misleading?

February 2025

Copyright SIPA 2025

Executive Summary

The private2000® index (the "index") delivered a 0.2%[1] total return in December, bringing the 2024 full year performance to 4.1%. Monthly index returns were positive for five consecutive months to close out 2024, showing stabilisation after experiencing heightened volatility to start the year. Nonetheless, recent private equities returns are well below the long-term return expectations of investors in private equities.

The private2000 index 2024 return of 4.1% is in line with the 2.7% total return achieved in 2023. The recent performance lags significantly behind longer term returns. The 3-year, 5-year, and 10-year total returns for the private2000 index are 9.1%, 8.6%, and 15.0%, respectively. Institutional limited partners ("LPs") target 15-20% gross IRRs when investing in private equity funds. But the recent performance of the market for private equities suggests that only high alpha funds will manage to deliver such returns.

Benchmarking Blues. Compounding the recent tepid performance of private equities, many pension funds' private equity returns are benchmarked to public market proxies (or, absolute return proxies) that have performed exceptionally well, positioning such funds as "underperformers." Both GPs and LPs must acknowledge that benchmarking a private equity portfolio against public equity indices can shift from a beneficial tailwind (2010-2018) to a challenging headwind (2020-present). More importantly, the use of public equities benchmarks makes the determination of alpha impossible as they do not reflect the returns and risk of the private equities market.

Canada's Maple 8. Reviewing the publicly disclosed[2] benchmarking practices of Canada's 8 leading pension funds, collectively known as the "Maple 8", five of the funds are using public market proxies to benchmark their private equities portfolios, while the remainder use absolute return benchmarks. Having pioneered the private markets investment strategy, the Canadian pension funds are lagging when it comes to benchmarking. The 2023 private equity returns across the group are aligned with the 2023 returns of the private2000 of ~3%. However, 2023 benchmarks were as high as 20.9% (BCIMC) and 16.3% (OTPP), leading to meaningful "underperformance." These cases are a glaring example of what can happen when using a benchmark that does not reflect the market you invest in. The recent upheaval at AIMCo may have been due in part to a poor understanding of how its private equity unit was performing.

Key Takeaway. The benchmarks employed by certain institutional investors fail to capture the performance and risk attributes of the private equities market. This leads to incorrect assessments of alpha generation and thus, fund, team, and portfolio performance. Pension fund leadership, trustees, and beneficiaries may not be well-informed about how their private equity portfolios are performing. This could be remedied by using the **Direct Alpha** method with the relevant private equities index.

[1] Unless otherwise stated, all return and risk data are for the VW USD private2000 index.
[2] 2023 Annual Reports of CPP Investments, AIMCo, OTPP, OMERS, BCIMC, HOOPP, CDPQ, PSP.

Copyright SIPA 2025

private2000 Performance

Returns for the private2000 index were modestly positive in December at 0.2%. Cash yield of 0.3% served to offset the 0.1% price decline. The recent period of low returns has also seen a decline in volatility. 3-year and 5-year Sharpe ratios of 0.37 and 0.4, respectively, are below the Sharpe ratio of 0.7 for the 10-year period. With lower returns, the cash component has become an increasingly larger percentage of total returns. In 2024, cash returns contributed approximately 350bps of the 413bps total annual return.

Table 1 below highlights the return and risk metrics of the index:

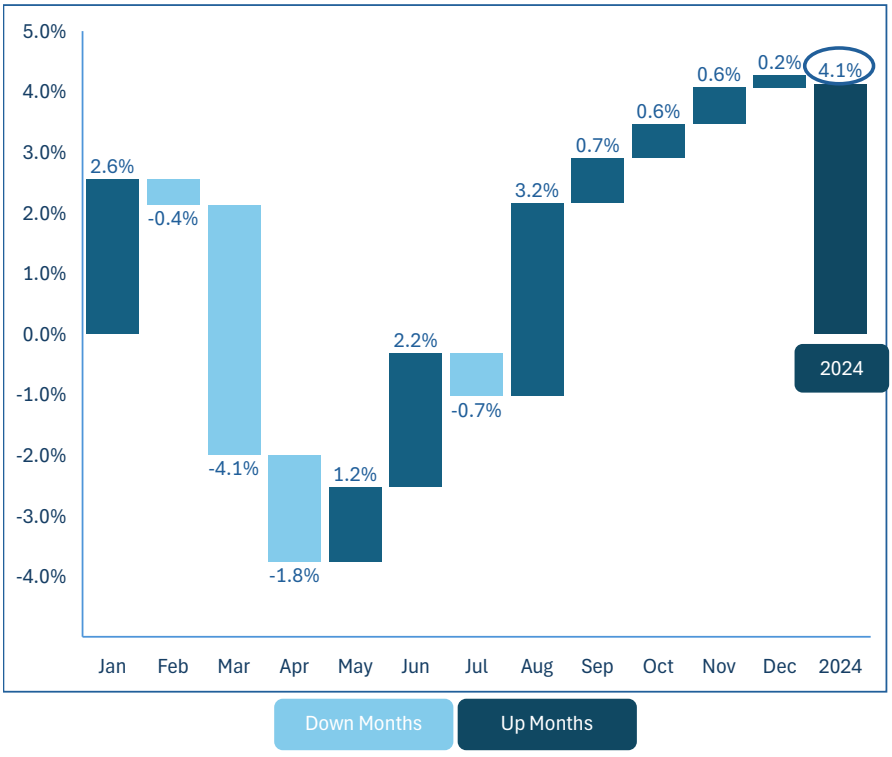
TABLE 1: PRIVATE2000 RETURN AND RISK DATA

	Tot. Returns 2024			Long-term Tot. Returns			Volatility		
	Dec	3mth	2024	3Y	5Y	10Y	3Y	5Y	10Y
private2000 USD	0.21%	1.38%	4.13%	9.07%	8.58%	14.98%	13.29%	15.15%	18.77%
private2000 LCL	1.41%	5.02%	7.67%	11.95%	10.27%	16.42%	12.76%	14.99%	18.45%

*Both indices are Value Weighted

Like other investable markets, private equities prices experience volatility. The private2000 index is priced monthly and is, thus, more reflective of the volatility experienced by investors in private equities. The chart below outlines the 2024 monthly return cadence.

FIGURE 1: PRIVATE2000 MONTHLY RETURN CADENCE



Source: privateMetrics

Despite a difficult start to the year, the index recovered from May through December, delivering a 4.1% annual return. The monthly volatility displayed here contrasts with the often stale and smoothed NAVs reported by fund managers to their LPs. Private equities

Copyright SIPA 2025

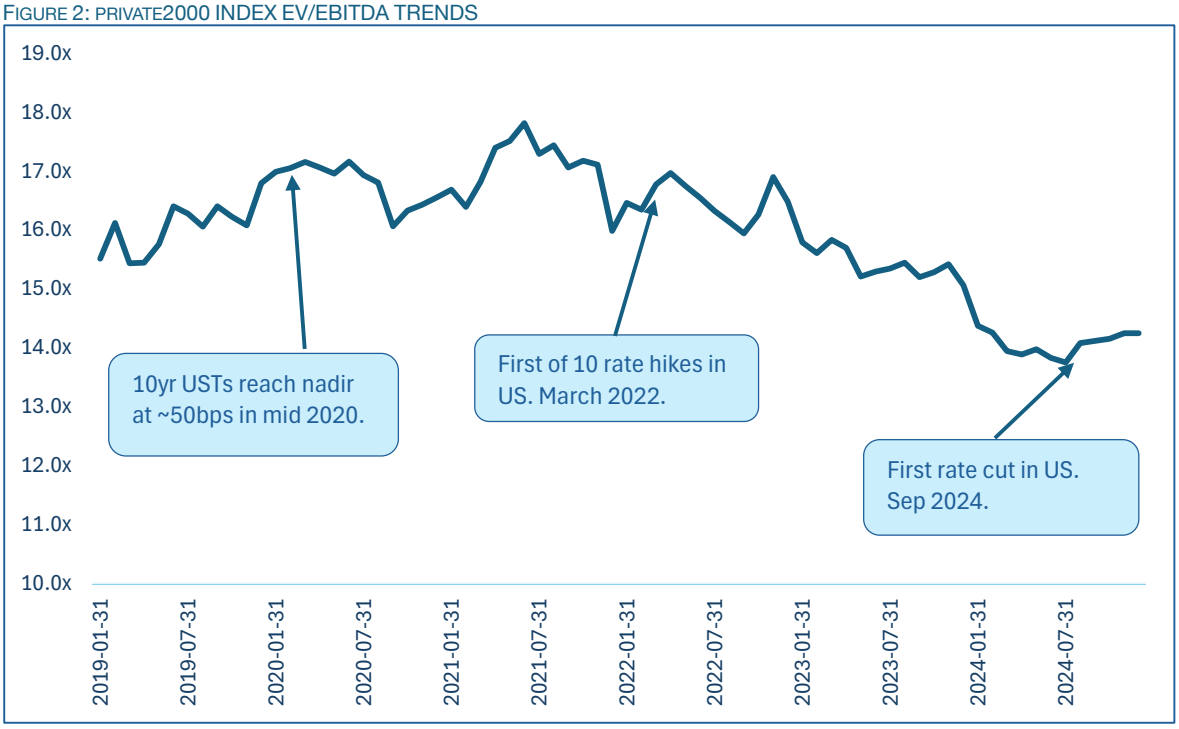
do not move in a straight line from quarter to quarter or year to year but face real-time changes in pricing due to changing supply and demand for private equities, style factor loadings and pricings, as well as movements in yield curves.

private2000 Valuation Trends

A key driver of recent performance has been a change in macroeconomic conditions, most notably the presence of elevated inflation. This has led to government bond yields in the U.S. that are 350-450 basis points higher than they were in 2020, impacting the cost of capital and thus, pricing.

The figure below outlines the monthly EV/EBITDA valuation metric for the private2000 index since early 2019.

FIGURE 2: PRIVATE2000 INDEX EV/EBITDA TRENDS



Source: privateMetrics

Private equities pricing has undergone an adjustment process since the emergence of inflationary conditions in 2021. The higher cost of capital has been one factor contributing to compression in traditional valuation multiples. The private2000 index illustrates this clearly, with the EV/EBITDA multiple peaking at 17.8x in June 2021 and falling to 13.8x by July 2024, a 23% haircut. Similarly, EV/Sales has fallen from 2.1x to 1.7x over the same period. Multiples over the last 3-4 months appear to be finding support, with recent declines in government bond yields supportive. The buoyant private credit and high yield markets have also served to keep credit spreads in check.

Since 2020, annual total returns in private equities have been considerably more modest compared to the strong performance in the years preceding 2020. The period of low

Copyright SIPA 2025

interest rates, ample liquidity, and expanding multiples has given way to an environment of higher capital costs and compressed multiples. In the following sections, we will explore the benchmarking challenges investors face in private equities given diverging private vs public equities performance.

Benchmarking Blues

Investors in both private equity funds and direct private equities remain challenged to find benchmarks that reflect the underlying equities in their portfolios. LPs have shifted away from absolute return benchmarks to tailored public market proxies. Absolute benchmarks (i.e. CPI + 500bps) were always inappropriate but offered low bars to exceed in the ZIRP environment and the illusion of indefinite alpha. They implied limited or no systematic risk exposure, which is not characteristic of the long-only private equities market. This is not to suggest that there was no alpha (see recent paper here: Do Private Assets Generate Alpha?), but that it cannot be determined against such a benchmark. Absolute return benchmarks emerged, in part, due to the need for asset and liability matching within pension funds. (see paper here: Absolute Return Report). Public market proxies offer another challenge in that they reflect the risk and characteristics of a different market; one comprised of listed equities. The dominant presence of passive investors and the low cost of diversification are at odds with the nature of investing in the private equities market.

Nevertheless, investors still reference public market indices when discussing their private equities portfolio. Some have moved away from a large cap universe such as the S&P 500 to MSCI World or even the Russell 2000, which has more exposure to small and mid-cap companies. Other in-house customisations are employed to reflect their unique portfolios, including controlling for market capitalisation and leverage.

As shown in the table below, public market indices have delivered higher total annual returns than the private2000 Index since 2019. Notably, in five of the past six years, public markets have outperformed the private2000 Index, marking a shift from the previous trend of consistent private equity outperformance.

TABLE 2: PRIVATE2000 RETURNS VS PUBLIC MARKET INDICES

Total Returns	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
private2000 USD	-0.3%	10.1%	16.7%	31.0%	37.5%	15.6%	7.8%	7.9%	21.3%	2.7%	3.1%
private2000 LCL	6.5%	15.8%	20.7%	23.3%	40.3%	16.2%	4.5%	11.3%	26.9%	2.7%	7.7%
Russell 2000	4.9%	-4.4%	21.3%	14.7%	-11.0%	25.5%	20.0%	14.8%	-20.4%	16.9%	11.5%
MSCI World	5.5%	-0.3%	8.2%	23.1%	-8.2%	28.4%	16.5%	22.4%	-17.7%	24.4%	19.2%
S&P 500	13.7%	1.4%	12.0%	21.8%	-4.4%	31.5%	18.4%	28.7%	-18.1%	26.3%	25.0%

*private2000 indices EW. Public market indices US$ returns.

Shifting among public market proxies does not resolve the core issue. Private equity portfolios should be benchmarked against the broader private equity market. Presumably investors made significant allocations to private equities because it offers exposure to a

Copyright SIPA 2025

different market with its own supply/demand dynamics, style factors, diversification, and opportunity for alpha generation. It follows then that the benchmark should also reflect the differing characteristics of the private equities market. To evaluate performance and determine if a fund manager or investment team is generating alpha, a relevant private equity benchmark is preferred.

Post 2020, there has been a regime change in interest rates that has weighed on private equities pricing and returns. At the same time, public market returns are increasingly led by large-cap technology companies with oligopolistic or monopolistic business models, experiencing robust growth. This has led to perceived underperformance by private equities relative to public equities. However, we must consider that the benchmarks are simply wrong.

By utilising the private2000 index and sub-indices as benchmarks, institutional allocators and fund managers may find that their performance is tracking in line with the private equities market. This would be the most logical conclusion. Managers, on average, do not generate alpha.

Given the higher cost of transacting in private equities vs public equities combined with misleading benchmarks, institutional LPs could find themselves having to defend their large private equity allocations against their public equities' counterparts.

Canada's Maple 8 Funds

The most recently available 2023 annual reports provide the return and benchmark information for Canada's 8 leading pension funds. The Maple 8 funds have significant allocations to private equity (10-20% of plan assets) and have mature, globally diversified portfolios comprised of fund investments and direct private equities. The table below outlines the disclosed practice, 2023 returns (2023R), 2023 benchmark (2023B), and the private2000 total returns in 2023.

Six of the eight pension funds generated single-digit net returns in 2023, while facing benchmarks that were well into the double digits. Looking at the relative performance, all meaningfully underperformed, ranging from 3.4% at AIMCo to 14.9% at BCI! Does this imply that these funds are destroying value? The benchmarks and relative performance provide no useful information to senior management, the board of directors, and trustees.

Worse still, the data may lead to incorrect conclusions about performance and rash decision-making that could impact long term performance in this important asset class. The pension fund returns were very much in line with the performance of the private2000 index, implying that many of these institutions were tracking the private market index. Instead of producing significant negative alpha, these funds may have been delivering flat or modest positive alpha in a difficult market environment. Of course, without knowing

Copyright SIPA 2025

the valuation techniques and frequency, we cannot say with certainty if reported returns would remain at these levels.

TABLE 3: MAPLE 8 BENCHMARKING PRACTICES

Pension Fund	PE Benchmarking Practice	2023R	2023B	Relative	private2000
CPP	Levered public market proxy. 5 yr rolling.	9.6%	na	na	2.7%
AIMCo	Absolute Return (CPI + 650bps)	6.7%	10.1%	-3.4%	
OMERS	Absolute Return	3.9%	9.6%	-5.7%	
BCI	Public market proxy	6.0%	20.9%	-14.9%	
OTPP	Public market proxy & CPI plus	3.6%	16.3%	-12.7%	
CDPQ	GXPEI (50%) + Public market proxy	1.0%	10.5%	-9.5%	
PSP[3]	Public market proxy. 5 yr rolling.	12.1%	na	na	
HOOPP	Public market proxy	14.1%	na	na	

*Sourced from 2023 Annual Reports
** 2023R is 1-yr total return for 2023. 2023B is disclosed 1-yr PE benchmark for 2023.

We highlight an excerpt from BCIMC's 2023 Annual Report below:

"Over the one-year period, private equity performance delivered positive results amidst challenging market conditions. ***The private equity benchmark, consisting of a public equity index, had its one-year performance driven by large technology stocks."***

The excerpt is an acknowledgement that its private equity team faces a benchmark that has little in common with its private equity funds and direct investments. This makes it exceedingly difficult to assess whether the in-house team and external managers are in fact, adding value, with positive alpha. Moreover, the source of the public market outperformance is not in the investable opportunity set for the private equity fund manager. Why is the private equity performance benchmarked against a tech-heavy public market index? Should the returns of "MAG 7" determine whether private equity has under/over performed in a given period?

They are not alone on this. The following is from OTPP's 2023 report:

"The private equity portfolio produced a return of 3.6% (local currency return of 5.4%), trailing its benchmark gain of 16.3% (18.3% gain by the local currency benchmark). ***This underperformance versus the benchmark was driven primarily by strong performance from the benchmark, which includes global, regional and country-specific public equity indices, as well as CPI-plus benchmarks."***

This statement is particularly bizarre given the focus on the "strength" of the benchmark rather than the strength/weakness of the portfolio that it is benchmarked against. Should we take from this that they underperformed the benchmark because the benchmark was

[3] PSP and CPP did not disclose a 1 yr benchmark. Only 5yr rolling.

Copyright SIPA 2025

too strong? How should the board or trustees interpret this? This inverts the purpose of the benchmark and performance evaluation.

Finally, we note that OMERS, which invests primarily directly, uses absolute returns:

*"OMERS benchmarks are for absolute rather than relative returns.…**We establish our private asset benchmarks through a bottom-up, investment-by-investment approach, using budgeted cash flows from our investee companies and real estate assets."***

This introduces another problem, whereby there is an implicit assumption that these assets are market neutral and have no or limited market exposure. Of course, private equity is a long-only strategy and thus faces systematic risks much like long only managers in public markets.

It is worth noting that none of the pension funds reviewed cited use of contributed fund manager benchmarks for the purposes of benchmarking their private equity performance. Contributed fund benchmarks conflate market exposure with the active bets made by individual managers, failing to provide an unbiased private equities market, from which alpha can be gleaned.

Overall, the benchmarking practices, by design, are likely to yield inconsistent results that offer little insight into the risk-adjusted performance of private equity. For example, PSP and HOOPP delivered the highest returns in the group, but we have no ability to determine if this was due to superior alpha, or higher market (beta) exposure. This leaves pension funds in the dark over the true performance of their private equity portfolios.

private2000 Risk Summary

The absence of frequent pricing has plagued the private equity markets, making it difficult to accurately assess risk and performance relative to other asset classes. Public market indices and contributed manager benchmarks fail to reflect the dynamics of the private equities market and can provide meaningless and inconsistent notions of alpha, or even underperformance.

The private2000 index, with its monthly pricing dating back to 2013, shows risk-adjusted performance metrics that 'make sense' (i.e. believable Sharpe ratios) for an investor in private equities, subject to systematic risk factors.

The table below shows volatility, Sharpe ratios, and Value-at-Risk (VaR) for the 3, 5, and 10-year periods. One can observe the recent moderating volatility and Sharpe ratios in the private2000 index. Further, the results are not dissimilar to the public market index, MSCI World.

Figure 3 below shows this more explicitly with the monthly percentage return trends dating back to early 2019.

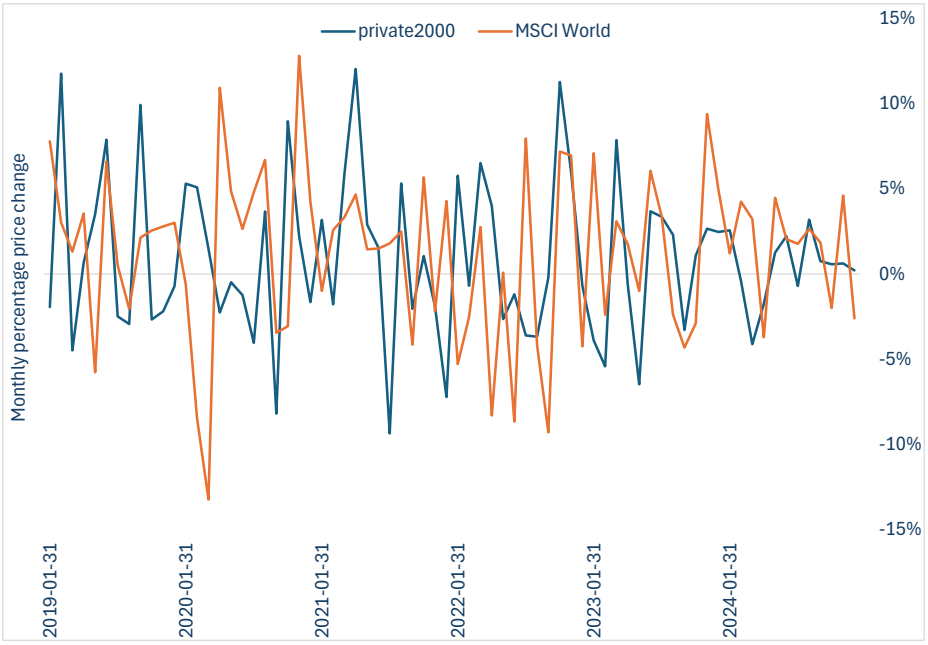
Copyright SIPA 2025

TABLE 4: PRIVATE2000 RISK DATA

	Volatility			Sharpe Ratio			Var (97.5%)		
	3yr	5yr	10yr	3Y	5Y	10Y	3Y	5Y	10Y
private2000	13.3%	15.2%	18.8%	0.37	0.40	0.70	16.2%	20.8%	20.7%
MSCI World	16.6%	17.9%	15.1%	0.43	0.62	0.65	23.0%	21.2%	18.7%

*MSCI World data US$ monthly returns

FIGURE 3: PRIVATE2000 VS MSCI WORLD INDEX MONTHLY PERCENTAGE RETURNS



Source: privateMetrics and MSCI.

Despite having volatility and Sharpe ratios that are similar to those of listed equities, the advantages of investing in private equities persist. They provide diversification via lower correlations with publicly traded assets and grant access to a significantly wider range of companies than those available in public markets.

The high costs and regulatory burden associated with listing mean that many companies stay private for longer (or forever), favouring significant allocations to private equities. While most institutional investors have capitalised on this, benchmarking practices have not evolved, threatening incorrect conclusions regarding performance.

Conclusion

Building diversified portfolios in private equities is expensive as the cost and complexity of transacting in private companies and funds are significant. Diversification is typically pursued "one level up" at the LP level, with GPs tasked to build concentrated portfolios (10-15 investments) in a focused strategy (i.e. middle market Industrials). This means that to determine alpha, one needs to use a method such as the Direct Alpha approach (here: **Direct Alpha**) utilising an appropriate private equities market index and thematic index reflecting the manager's geography, activity class (sector), and lifecycle (growth, mature), among other pillars.

Copyright SIPA 2025

The private equities market operates partly independently of listed markets, exhibiting unique supply and demand dynamics, systematic risk factors, and correlations with other asset classes. As a result, an appropriate benchmark should reflect these characteristics rather than those of a different market.

LPs, holding a diversified portfolio of underlying funds and private equities, should be benchmarked by a private equities market index that reflects the private equities universe. This approach makes it more likely that LP portfolios are closely tracking the market index, rather than demonstrating significant underperformance or outperformance compared to public market proxies, resulting in a poor reflection of relative performance.

Copyright SIPA 2025

Appendix

The privateMetrics® 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:

Copyright SIPA 2025

- **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.

Copyright SIPA 2025

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.

$$\frac{P}{S} = a + \sum_{k=2}^{K} b_k l_k + e$$

Following standard asset pricing notation, the factor exposure or factor loading is called a beta (β), 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

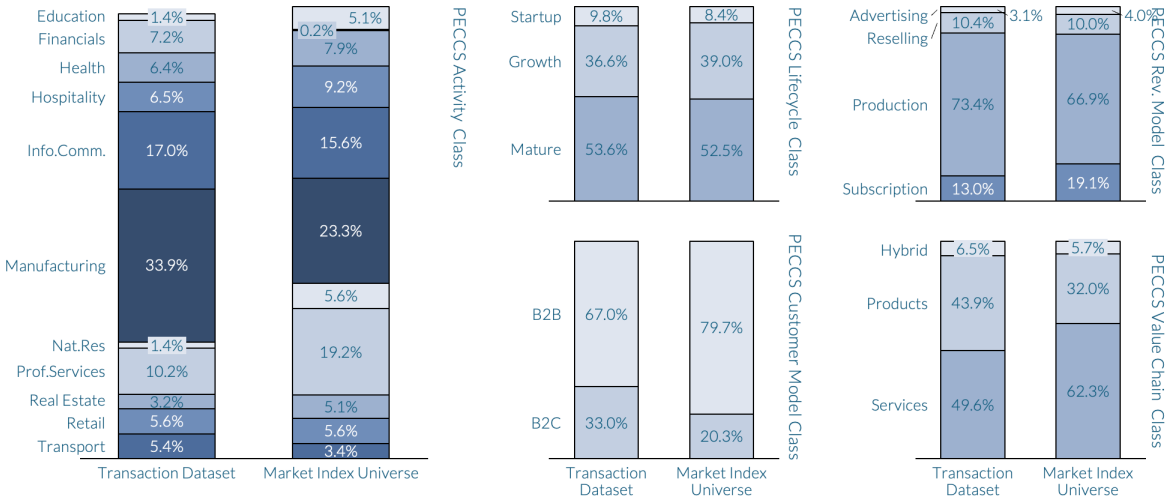
The privateMetrics model uses a carefully curated dataset of more than 10k+ unlisted private company investments going back two decades sourced from a wide variety of datasets including PitchBook, Factset, Capital IQ, fund manager reports, and other publicly available data sources.

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).

Copyright SIPA 2025

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



How precise are the predictions across PECCS® 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.

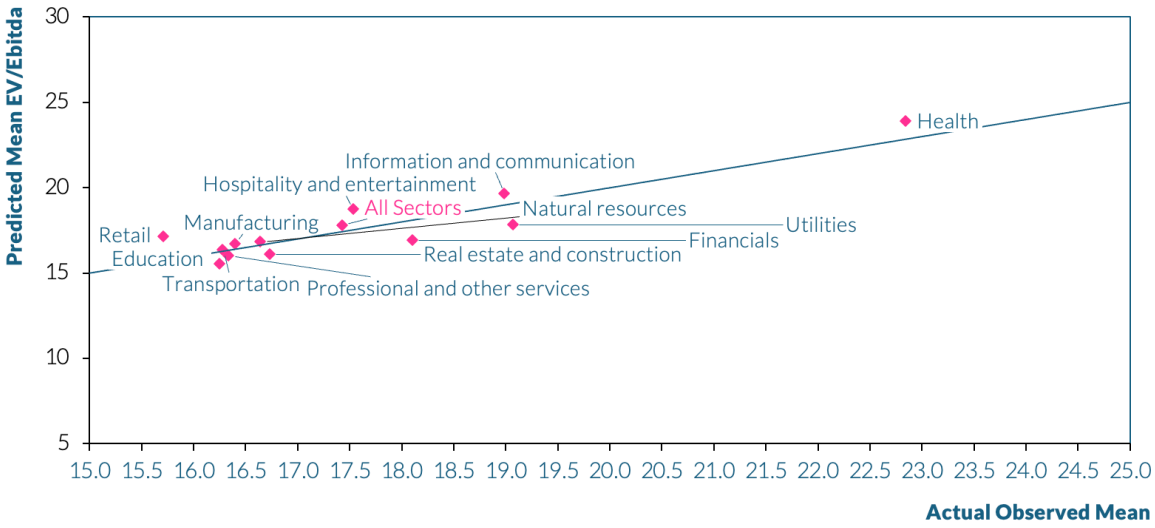
Copyright SIPA 2025

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

Copyright SIPA 2025

About Scientific Infra & Private Assets

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.

Contact Information

London Office

10 Fleet Place,
London EC4M 7RB
United Kingdom
+44 (0)207 332 5600

email: sales@sipametrics.com

web: www.sipametrics.com

Singapore Office

One George Street
#15-02
Singapore 049145
+65 66538575

Copyright SIPA 2025

Disclaimer

The information contained on this proposal (the "information") has been prepared by EDHEC Infra & Private Assets solely for informational purposes, is not a recommendation to participate in any particular investment strategy and should not be considered as an investment advice or an offer to sell or buy certain securities.

All information provided by EDHEC Infra & Private Assets is impersonal and not tailored to the needs of any person, entity or group of persons. The information shall not be used for any unlawful or unauthorised purposes. The information is provided on an "as is" basis.

Although EDHEC Infra & Private Assets shall obtain information from sources which EDHEC Infra & Private Assets considers to be reliable, neither EDHEC Infra & Private Assets nor its information providers involved in, or related to, compiling, computing or creating the information (collectively, the " EDHEC Infra & Private Assets Parties") guarantees the accuracy and/or the completeness of any of this information.

None of the EDHEC Infra & Private Assets Parties makes any representation or warranty, express or implied, as to the results to be obtained by any person or entity from any use of this information, and the user of this information assumes the entire risk of any use made of this information. None of the EDHEC Infra & Private Assets Parties makes any express or implied warranties, and the EDHEC Infra & Private Assets Parties hereby expressly disclaim all implied warranties (including, without limitation, any implied warranties of accuracy, completeness, timeliness, sequence, currentness, merchantability, quality or fitness for a particular purpose) with respect to any of this information.

Without limiting any of the foregoing, in no event shall any of the EDHEC Infra & Private Assets Parties have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits), even if notified of the possibility of such damages.

All EDHEC Infra & Private Assets Indices and data are the exclusive property of EDHEC Infra & Private Assets. 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. In many cases, hypothetical, back-tested results were achieved by means of the retroactive application of a simulation model and, as such, the corresponding results have inherent limitations.

The Index returns shown do not represent the results of actual trading of investable assets/securities. EDHEC Infra & Private Assets maintains the Index and calculates the Index levels and performance shown or discussed but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. Back-tested performance may not reflect the impact that any material market or economic factors might have had on the advisor's management of actual client assets.

The information may be used to create works such as charts and reports. Limited extracts of information and/or data derived from the information may be distributed or redistributed provided this is done infrequently in a non-systematic manner. The information may be used within the framework of investment activities provided that it is not done in connection with the marketing or promotion of any financial instrument or investment product that makes any explicit reference to the trademarks licensed to EDHEC Infra & Private Assets (EDHEC Infra & Private Assets, Scientific Infra & Private Assets and any other trademarks licensed to EDHEC Group) and that is based on, or seeks to match, the performance of the whole, or any part, of a EDHEC Infra & Private Assets index. Such use requires that the Subscriber first enters into a separate license agreement with EDHEC Infra & Private Assets. The Information may not be used to verify or correct other data or information from other sources.

Copyright SIPA 2025