

PRIVATE EQUITIES IN 2024

The calm before a new surge?

January 2025

Executive Summary

As we head into 2025, the market or exit price of private equities remain under intense scrutiny amid shifting macroeconomic conditions, increased regulatory oversight, and heightened liquidity demands from limited partners.

This report uses the privateMetrics database, with a coverage over one million companies across 150 countries, to provide a detailed analysis of the latest valuation multiples, including EV/Sales, Price/Book, and EBITDA multiples as estimated using the most recent transactions monthly.¹

The report highlights key valuation trends, strategic investment opportunities, and sector-specific insights in private equities using the PECCS® classification system to facilitate accurate peer comparisons.

1. The market price of private equities held up despite market uncertainty – While exit activity slowed and liquidity tightened, but market price multiples remained elevated, signalling continued investor confidence across most industries.
2. Financials, Natural Resources, and Transportation led in EV/Sales, while Information & Communication commanded the highest Price/Book multiples, reflecting strong intangible asset valuations.
3. EBITDA Multiples Highlight Profitability Premium – Healthcare, Information & Communication, and Professional Services saw the highest EBITDA multiples, while Retail and Real Estate & Construction showed greater valuation dispersion.
4. Financial Performance Impacts Multiples Differently – While sales and book values declined across many sectors, multiples still expanded, indicating that investor sentiment and future growth expectations outweighed short-term financial weaknesses.
5. Subscription-based revenue models, particularly in Health and Information & Communication, attracted higher valuations. B2B industries like Financials and Professional Services remained more stable than consumer-driven sectors.

¹ Price estimation for the broad market private company universe are obtained using a multi-factor asset pricing model calibrated monthly with the latest exit price data observable in the market.

Reported NAVs vs. Market Prices

The past couple of years haven't been very kind to private equities, amid higher rates, a slower exit environment, fewer distributions, and longer fundraising periods. Exit values remain the most debated topic.

Reported NAVs are known to be backward-looking and what used to be described as prudently 'conservative' (under-valued) may now be over-valued. NAV discounts of 20-25% in LP-led secondaries for example are not unheard off.

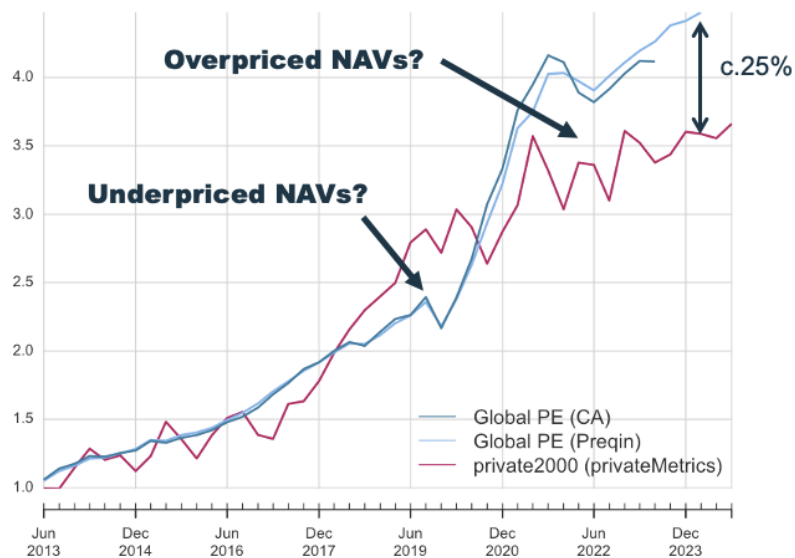
A good approximation of this phenomenon can be obtained by comparing the level of indices that are calculated by aggregating fund-level performance, such as the Cambridge Associates Global PE Buyout Index and the private equities market index represented by the private2000 index. Figure 1 shows the growth in value of one dollar invested in June 2013.

We see that reported NAVs and market prices diverge during long periods. In times of market expansion, NAVs tends to be below fair value (exit) market prices, which in times of market moderation it tends to be the opposite.

As a result, average changes in reported NAVs in 2024 are not providing the full picture of what happened in the market for private equities.

Conversely, privateMetrics does not use or report 'valuations' as represented by reported NAVs but instead uses observable exit prices to calibrate an asset pricing model and estimate the market price of private equities.

FIGURE 1: PRIVATE EQUITIES MARKET (NET RETURNS) VS. FUND MANAGER INDICES (2013-2024)



Source: privateMetrics, Cambridge Associates, Preqin - average fees: 2.5%

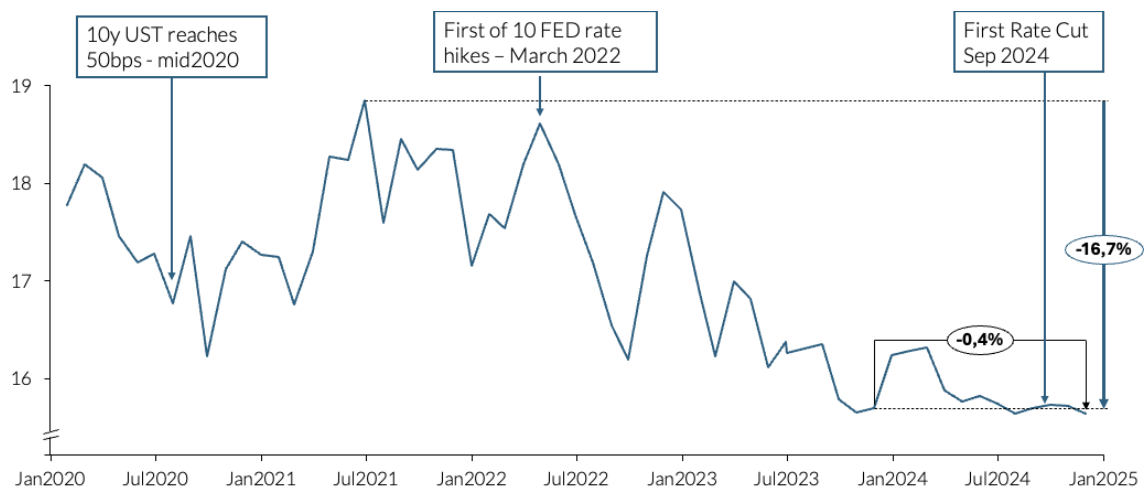
Private Equities Market Prices in 2024

Having benefitted from a supportive environment until the second half of 2020, the global market for private companies, as represented by the private2000 index, held steady until mid 2022, but started a declining trend, eventually suffering a 16.7% drop in value as measured by EBITDA multiples as shows on Figure 2.

In comparison, 2024 has been benign with values holding up and declining by a mere -0.4% on a 12-month basis at the end of November 2024.

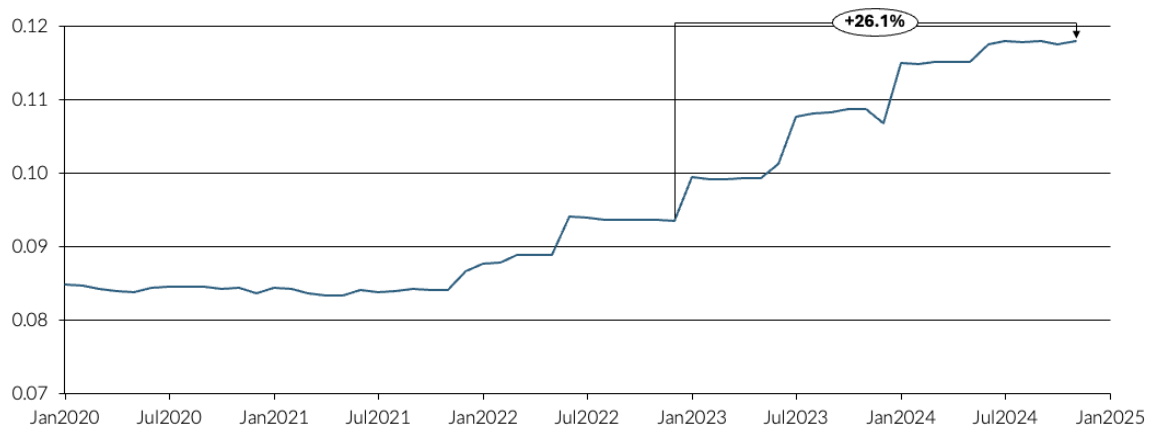
As we discuss in the rest of the report, market prices held steady in most sectors and perhaps this period will be remembered as a “good time to buy” private equities which have certainly come down when compared with appraisals while the average EBITDA margin of the private2000 constituent index has increased by 26% over the past year (Figure 3)

FIGURE 2: PRIVATE2000 INDEX EV-TO-EBITDA (2020-2024)



Source: privateMetrics

FIGURE 3: PRIVATE2000 INDEX EBITDA MARGIN IN % (2020-2024)



Market Multiples in privateMetrics

A robust and consistent methodology to measure the average fair value of companies in the private equities market must rest on three key elements:

- i) a robust approach to estimate the current exit price (fair value) of assets on average.
- ii) a classification system to organise assets into groups with similar risk and return characteristics; and
- iii) a definition of the relevant and representative universe of assets.

privateMetrics meets these requirements scientifically and objectively and produces estimates of the potential exit prices of private companies.

- Market prices in privateMetrics are estimated monthly using a dynamic factor model that can explain observed exit prices on average with a very low error, both in aggregate and at market segment level. The market prices of each individual company is determined by its exposures to certain factors (e.g., its size, leverage, etc.) and the impact of the market on each price factor, which is inferred from observable transactions from one month to the next. To find out more about this approach, refer to this [publication](#).
- Second, PECCS® (the Private Company Classification Standard), created by the EDHEC, is a multi-dimensional classification scheme for private companies, comprising five independent pillars: the industrial activity, lifecycle phase, revenue model, customer model, and value chain type. These pillars help create peer groups of companies exposed to similar systematic factors, thus maximising the insights one can draw about private companies while dealing with limited data availability in private markets. (Find out more about PECCS® [here](#).)
- Third, privateMetrics curates a Private Equity Universe (PEU) of private companies, itself drawn from a larger Broad Market Universe (BMU) of private firms. The PEU is constructed from the BMU by filtering for size and profits that matches the characteristics of known PE portfolio companies. The BMU comprises over 1.2 million eligible private companies from over 150 countries that are for-profit, not publicly listed, not majority government-owned, not part of infraMetrics®, and have at least USD1 million in revenue. The PEU includes 80k+ companies and represents USD13.4T of market capitalisation in mid 2024. Find out more about the PEU [here](#).

Thanks to this approach, it is possible to estimate market price levels in numerous different segments of the market without sacrificing any robustness since privateMetrics recomputes millions of asset prices each year.

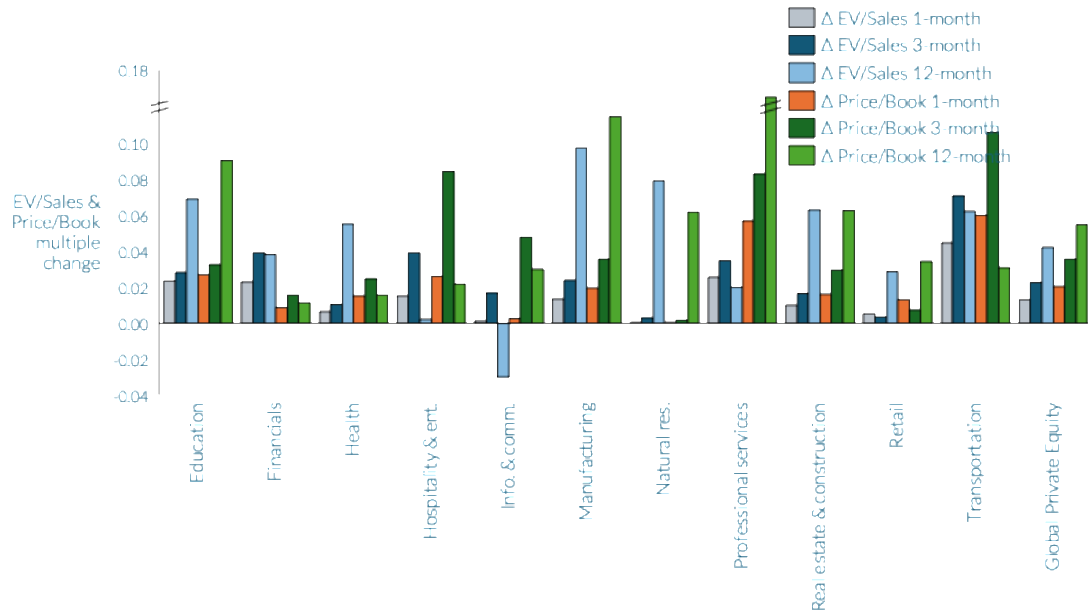
12-Month Market Price Evolutions

Valuation Multiple Changes: Sectoral View

Valuation multiples have shifted over the past year across various industries. Figure 4 presents one-month, three-month, and 12-month changes in EV/Sales and Price/Book multiples, providing insight into industry-specific movements. On average, sales multiples expanded by 0.04x over the past year, while Price/Book multiples increased by 0.06x. However, valuation trends vary significantly by sector.

- Manufacturing saw the strongest valuation growth, with the largest 12-month increase in both EV/Sales and Price/Book multiples. This indicates heightened investor confidence in the sector's resilience amid supply chain stabilization and industrial demand.
- Financials and Natural Resources recorded significant Price/Book expansions, supported by strong asset-backed valuations and capital efficiency, while EV/Sales multiples remained stable, reflecting steady revenue growth in these sectors.
- Information & Communication experienced a notable divergence, with EV/Sales multiples declining, suggesting weaker revenue expansion, while Price/Book multiples increased, indicating stronger investor sentiment toward asset-light, high-margin businesses.
- Hospitality & Entertainment faced headwinds, with EV/Sales multiples contracting, highlighting ongoing pressure on revenue growth and profitability despite consumer activity recovery. Price/Book multiples showed only slight improvements, reinforcing investor caution.
- Retail and Real Estate & Construction exhibited high volatility, with Price/Book multiples fluctuating significantly, signalling market uncertainty regarding interest rate impacts, consumer demand, and asset valuations in capital-intensive industries.

FIGURE 4: CHANGES IN SALES AND BOOK VALUE MULTIPLES IN GLOBAL PRIVATE EQUITY BY PECCS® INDUSTRIAL ACTIVITY – NOVEMBER 2024

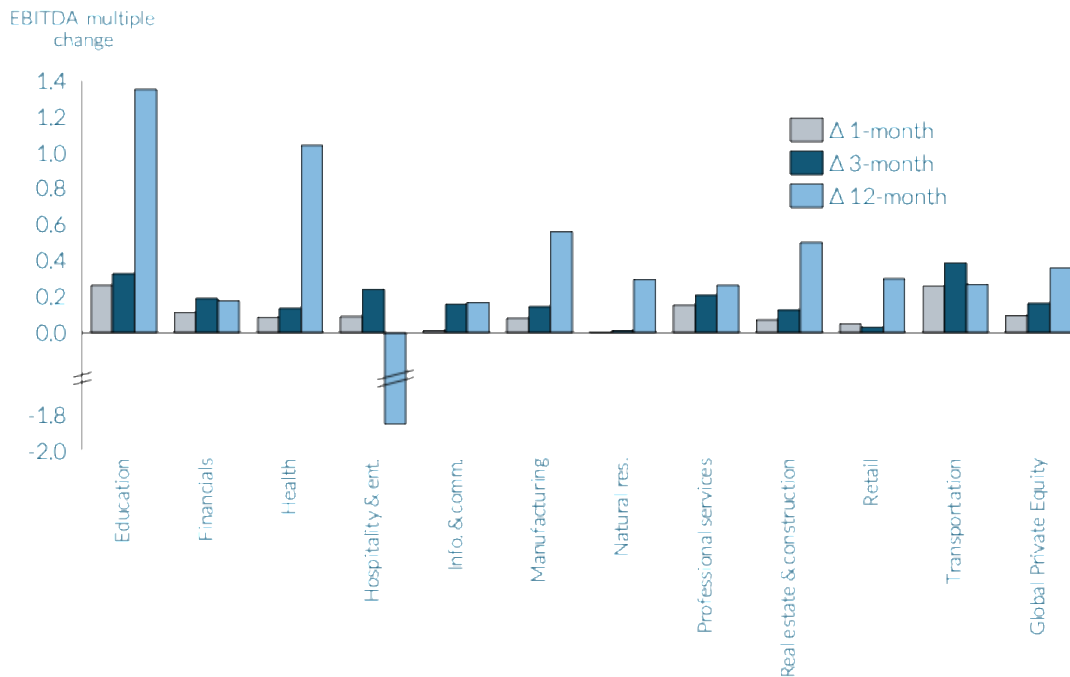


Source: privateMetrics, as of 30/11/2024. Changes are computed as the median of same company differences in each group.

Figure 5 highlights changes in EV/EBITDA multiples, showing profit-driven valuation adjustments across industries:

- Education and Health sectors experienced the largest 12-month EBITDA multiple growth, reflecting strong investor confidence in stable, long-term revenue models.
- Hospitality & Entertainment was the only sector with a significant decline in EBITDA multiples, indicating weaker profitability and demand recovery challenges.
- Manufacturing, Real Estate & Construction, and Retail showed moderate but steady increases, suggesting resilience in capital-intensive and consumer-driven industries.

FIGURE 5: CHANGES IN UNADJUSTED EBITDA MULTIPLES IN GLOBAL PRIVATE EQUITY BY PECCS® INDUSTRIAL ACTIVITY



Source:

privateMetrics, as of 30/11/2024. Changes are computed as the median of same company differences in each group.

Understanding the Impact of Changes in Financial Metrics on Market Price Multiples

Market Price multiples are not static and can be significantly influenced by fluctuations in the underlying financial metrics used in their calculation. Table 3 shows the average changes in Sales, Book Value, and EBITDA and how these shifts impact different valuation multiples.

- Sales:** Over the past 12 months, sales figures have decreased slightly in most industries, with the notable exception of the **Health** sector, which experienced a 3.2% increase. For most sectors, other things than sales growth are driving changes in valuation multiples.
- Book Values:** Book values have predominantly declined much more than sales across sectors. This contributes to an overall increase in the **Price/Book ratio**. As book values shrink, the denominator of the Price/Book ratio decreases, leading to an increase in the multiple, even if the equity valuation (the numerator) remains constant or experiences modest growth.
- EBITDA:** When examining profitability, measured by EBITDA, the most substantial expansion is observed in the **Education** and **Health** industries. However, it's important to note that, across most industries, EBITDA growth has not matched the pace of EV expansion, resulting in a slight increase in **EBITDA multiples**. This indicates that, while profitability has improved in certain sectors, the market is assigning a higher value to these businesses beyond their current earnings performance.

TABLE 3: AVERAGE CHANGES IN VALUATION MULTIPLE COMPONENTS BY PECCS® INDUSTRY

PECCS Industry Class	% change in average value over 12 months			Direction of change in valuation multiples		
	Sales	Book Value	EBITDA	EV/Sales	P/Book value	EV/EBITDA
Education and public	0.2%	-2.9%	15.3%	+	+	+
Financials	-1.5%	-11.4%	-0.7%	+	+	+
Health	3.2%	-3.5%	4.8%	+	+	+
Hospitality and entertainment	-0.4%	-7.2%	-9.7%	+	+	-
Information and communication	-1.0%	-11.3%	1.7%	-	+	+
Manufacturing	-0.1%	-8.8%	-1.5%	+	+	+
Natural resources	0.6%	-16.6%	-0.8%	+	+	+
Professional and other services	-0.7%	-4.8%	1.3%	+	+	+
Real estate and construction	-2.4%	-8.6%	-3.8%	+	+	+
Retail	-0.6%	-8.2%	-0.9%	+	+	+
Transportation	-2.4%	-10.3%	-3.6%	+	+	+
PE Universe Total	-0.3%	-8.1%	-0.1%	+	+	+

Implications

- The consistent expansion in **EV/Sales multiples** across all industries, even in cases where sales have increased, highlights that **Enterprise Value (EV)** is growing at a faster rate than sales. This suggests a positive market sentiment and investor confidence, leading to a higher valuation being attributed to businesses relative to their revenue generation.
- The inverse relationship between shrinking book values and the rising **P/Book ratio** emphasizes the sensitivity of this multiple to changes in the underlying asset base of a company. Investors should carefully consider the reasons behind declining book values, as they could stem from asset write-downs, depreciation, or divestitures, which may or may not reflect negatively on the company's future prospects.
- While expanding EBITDA generally leads to higher valuations, the fact that **EBITDA multiples** have increased even when EBITDA growth lags behind EV expansion suggests that other drivers are contributing to company valuations.

Latest Market Price Levels

Tables 1 and 2, describe private equities market prices as multiples of sales, book value, and Unadjusted EBITDA, by PECCS® industry class, using the privateMetrics universe of companies valued at the end of November 2024.

TABLE 1: QUANTILES OF EV/SALES AND PRICE/BOOK VALUATION RATIOS BY PECCS® INDUSTRIAL ACTIVITY – NOVEMBER 2024

PECCS Activity	EV/Sales			Price/Book			Obs. (000s)
	25th Percentile	50th Percentile	75th Percentile	25th Percentile	50th Percentile	75th Percentile	
Education	1.4x	1.6x	2.0x	1.4x	1.7x	2.2x	4.9
Financials	2.2x	3.7x	4.9x	0.2x	0.5x	3.9x	12.0
Health	1.4x	1.7x	1.9x	3.1x	3.6x	4.3x	13.1
Hospitality and entertainment	1.6x	2.0x	2.5x	2.5x	3.5x	4.8x	13.1
Information and communication	1.5x	2.1x	2.7x	4.2x	6.5x	8.9x	14.9
Manufacturing	1.6x	2.0x	2.7x	1.8x	3.3x	5.5x	13.4
Natural resources	2.1x	3.1x	4.3x	1.5x	3.8x	7.4x	6.3
Professional and other services	1.6x	2.1x	2.8x	2.4x	4.0x	6.1x	21.5
Real estate and construction	1.4x	1.9x	2.7x	1.5x	3.1x	6.5x	7.6
Retail	0.9x	1.2x	1.6x	1.7x	3.2x	6.7x	12.9
Transportation	1.7x	2.4x	3.6x	1.2x	3.1x	7.1x	1.5
Global Private Equity	1.5x	1.9x	2.8x	1.9x	3.6x	5.9x	121.2

Source: privateMetrics, as of 30/11/2024

TABLE 2: QUANTILES OF UNADJUSTED EBITDA MULTIPLES BY PECCS® INDUSTRIAL ACTIVITY – DECEMBER 2024

PECCS Activity	25th Percentile	50th Percentile	75th Percentile	Inter-quartile range	Obs. (000's)
Education	16.5x	19.8x	25.1x	8.6x	4.9
Financials	12.4x	16.7x	23.3x	10.9x	12.0
Health	19.7x	22.7x	26.4x	6.7x	13.1
Hospitality and entertainment	10.5x	13.0x	16.6x	6.0x	13.1
Information and communication	15.0x	19.5x	24.9x	9.9x	14.9
Manufacturing	8.7x	13.4x	22.5x	13.7x	13.4
Natural resources	8.5x	13.1x	24.0x	15.5x	6.3
Professional and other services	9.4x	13.2x	20.1x	10.6x	21.5
Real estate and construction	9.8x	16.2x	27.4x	17.5x	7.6
Retail	7.9x	13.9x	25.7x	17.7x	12.9
Transportation	8.4x	13.3x	22.5x	14.1x	1.5
Global Private Equity	10.8x	16.3x	23.9x	13.1x	121.2

EV/Sales and Price/Book Valuation Multiples

EV/Sales reflects a company's enterprise value relative to its revenue and is often used in capital-intensive or high-growth sectors. Price/Book, on the other hand, measures a company's market valuation against its book equity, providing insights into asset-heavy or intangible-driven businesses. Table 1 shows the EV/Sales and Price/Book metrics by PECCS® industry segment, compared against the global private equities market, representing more than 121k observations for Sept. 2024.

The Financials, Transportation, and Natural Resources sectors have **strong multiples**, specifically in EV/Sales, whereas Information and Communication exhibits strong Price/Book multiples. This can be attributed to several things:

- Financials, Natural Resources, and Transportation remain the top-performing sectors in EV/Sales, with median multiples of 3.7x, 3.1x, and 2.4x, respectively. These industries benefit from strong cash flow generation and favourable market positioning, supporting elevated revenue-based valuations.
- Information & Communication maintains the highest Price/Book multiple at 6.5x, reflecting high intangible asset value and strong scalability in technology-driven business models. The sector also holds an above-median EV/Sales multiple of 2.1x, reinforcing its premium valuation profile.
- Education & Public Services and Retail continue to trade at lower valuation multiples, with EV/Sales medians of 1.6x and 1.2x, respectively. These sectors face structural headwinds, including weaker growth trajectories and investor caution regarding long-term earnings potential.
- Healthcare maintains a balanced valuation profile, with an EV/Sales multiple of 1.7x and a Price/Book multiple of 3.6x. The sector's steady demand and resilient profitability continue to position it as a stable investment avenue.

Interquartile Range (IQR) Analysis

The dispersion of valuation multiples across industries provides further insight into sector-specific risk and investor sentiment. The IQR spread between the 25th and 75th percentile multiples highlights sectors with greater valuation uncertainty, often linked to cyclical revenue trends, capital structure variability, or market sentiment shifts.

- Real Estate & Construction, Retail, and Transportation demonstrate the widest IQRs for Price/Book, reflecting significant valuation variability due to differences in capital intensity and asset-based valuation models.
- Natural Resources shows a large IQR across both EV/Sales and Price/Book, indicating valuation dispersion based on commodity price fluctuations and cyclical demand trends.
- Healthcare, Hospitality & Entertainment, and Education & Public Services maintain relatively lower IQRs, signalling greater valuation consistency and lower dispersion within these sectors.

EBITDA Multiples: A Deeper Dive

EBITDA multiples provide a critical lens into the earnings potential of a company, offering insights into how industries are adapting to evolving market conditions. Table 2 shows unadjusted EBITDA multiples by industry.

Industry Insights

- Healthcare commands the highest median EV/EBITDA multiple at 22.7x, reflecting investor confidence in long-term profitability and high-margin business models.

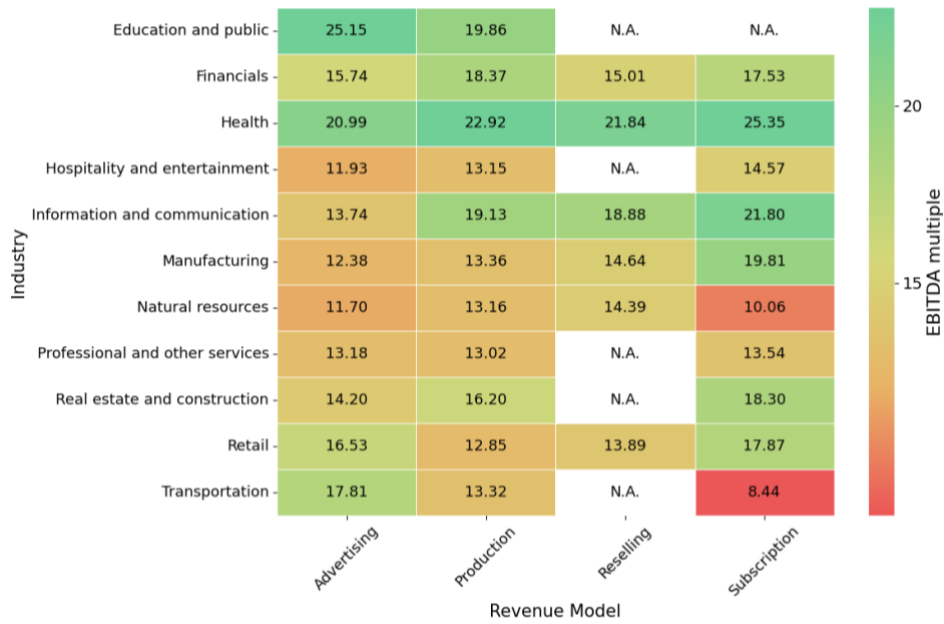
- Information & Communication follows with a median multiple of 19.5x, supported by high asset-light scalability and technology-driven growth.
- Professional & Other Services maintains an EV/EBITDA median of 13.2x, balancing strong cash flow generation with sector-wide valuation stability.
- Retail presents the widest IQR in EBITDA multiples, spanning nearly 18x, underscoring divergent valuation trends between traditional retail chains and high-growth digital platforms.
- Real Estate & Construction and Natural Resources show significant variability in EBITDA multiples, with interquartile ranges of 17.5x and 15.5x, respectively. These fluctuations highlight capital structure differences and macroeconomic exposure within these asset-heavy industries.

Valuation Dynamics by Market Segment

A nuanced industry view is essential in the valuations of private equities. The PECCS® classification system helps contextualize valuation shifts across sectors:

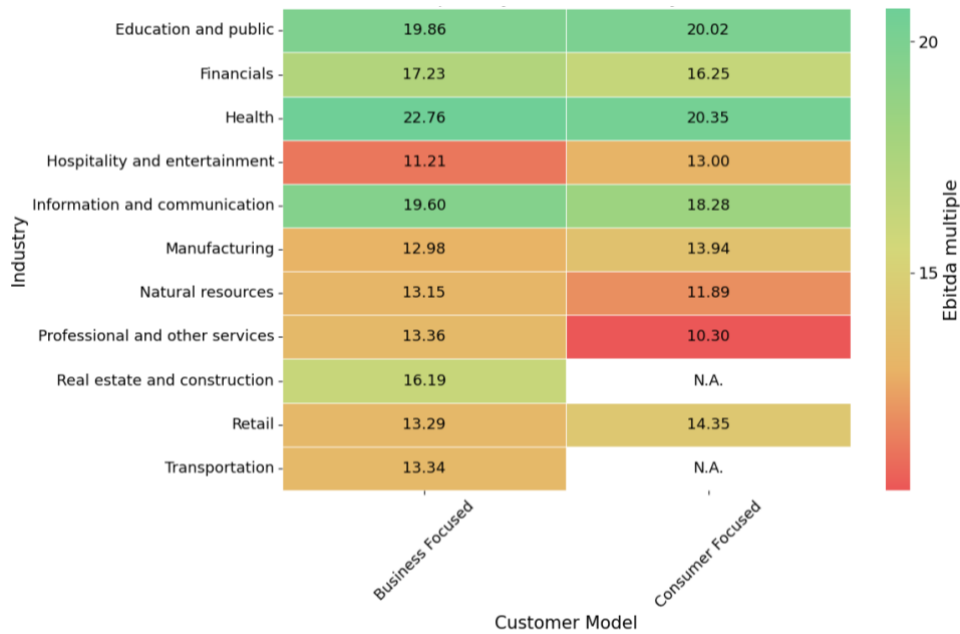
- Revenue Models: Subscription-based models generally receive higher valuations, but their significance varies by industry. Figure 3 illustrates how technology-based subscription businesses command premium multiples, whereas subscription services in mature industries see limited valuation uplift.
- Customer Models: Business-to-business (B2B) models are generally favoured by investors. Figure 4 shows strong valuation premiums in Health, Financials, and Natural Resources, where B2B revenue streams provide stability. However, in consumer-driven industries, business-to-consumer (B2C) models often generate higher valuation multiples due to brand loyalty and direct customer relationships.

FIGURE 3: UNADJUSTED EBITDA MULTIPLES IN THE PEU BY PECCS® INDUSTRIES AND PECCS® REVENUE MODEL



Source: privateMetrics, as of 30/11/2024

FIGURE 4: UNADJUSTED EBITDA MULTIPLES IN THE PEU BY PECCS® INDUSTRIES AND PECCS® CUSTOMER MODEL



Source: privateMetrics, as of 30/11/2024

Conclusion

The private equities market in 2024 demonstrated resilience amid persistent macroeconomic challenges, with market price multiples remaining strong despite headwinds in sales and book values.

Sectoral dynamics varied, industries with high-margin, recurring revenue models—such as Healthcare, Information & Communication, and Professional Services—commanded premium valuations, whereas capital-intensive sectors saw wider valuation dispersion. Investor confidence has remained intact, driven by long-term growth expectations and an emphasis on scalable business models.

Looking ahead to 2025, private equity investors will need to navigate a dynamic valuation environment with a heightened focus on strategic sector selection, financial discipline, and operational efficiency. As liquidity constraints persist and capital allocation becomes more selective, valuation transparency, risk-adjusted returns, and revenue model sustainability will be critical in determining investment success in the evolving private equities landscape.

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 in 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 USD 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 & George & Chuan-Yang (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 at a lower price	Jiang, Charles & Zhang (2005)
Country Risk	Term Spread	Negative	Companies in high-risk countries face more uncertain prospects	Chen & Tsang (2013)

Source: calculated using more than 10,000 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.

Empirical evidence supporting common risk factors

To illustrate the systematic effect these factors have on valuation, in Table 2 we summarise the average P/S ratio in each quartile of the transaction sample segmented by each of these factors. Even in this single-dimensional sort, the trends as we move along the quartiles strongly indicate the presence of systematic effects in valuation. For example, viewing the size factor, we can observe that the smallest companies (those that belong to the bottom quartile) enjoy the highest valuation per USD of sales, and this keeps decreasing as we move up the quartiles one by one.

In Table 3 we summarise the average P/S ratio by each class in a PECCS[®] pillar. PECCS[®] is a private-asset focused multi-pillar taxonomy of private companies developed by EDHEC Infra and Private Assets. By focusing on independent pillars with exhaustive and non-overlapping classes within each pillar, PECCS[®] can capture several dimensions of risk factors that affect the valuation of private companies. Moreover, the PECCS[®] classification is objective and clearly defined to enable one to segment private companies even with the limited information that is a hallmark of private markets. Consistent with this, we find that the valuation in transactions varies systematically by PECCS[®] classes, with many of the classes having significantly different mean P/S compared to the other classes.

TABLE 2: KEY FACTORS, THEIR EFFECT ON VALUATION, & THE ECONOMIC RATIONALE TO INCLUDE THEM IN THE MODEL

Sample	Size	Growth	Profitability	Maturity	Leverage	Country Risk
Top Quartile	2.1x	3.0x	4.2x	2.1x	3.8x	2.3x
Second Quartile	2.5x	2.8x	2.5x	2.5x	2.7x	2.9x
Third Quartile	2.8x	2.6x	1.8x	3.1x	2.5x	3.0x
Bottom Quartile	3.5x	2.5x	2.5x	3.2x	2.2x	2.8x

Source: Calculated using more than 10,000 deals from PitchBook, CapitalIQ, Factset, and other primary sources between 1999-2022

TABLE 3: DISTRIBUTION OF THE CALIBRATION DATASET BY PECCS® PILLARS

PECCS Pillar	PECCS Class	P/S	PECCS Class	P/S	PECCS Pillar
PECCS Activity	Education and public	1.9x	Startup	2.4x***	PECCS Lifecycle Phase
	Financials	2.4x***	Growth	2.1x	
	Health	2.1x	Mature	2.6x***	
	Hospitality and entertainment	1.9x***	Advertising	2.1x***	PECCS Revenue Model
	Information and communication	2.6x***	Reselling	1.4x***	
	Manufacturing	1.5x***	Production	1.6x***	
	Natural resources	1.9x	Subscription	2.9x***	
	Professional and other services	1.6x**	B2B	1.8x	PECCS Customer Model
	Real estate and construction	1.8x	B2C	1.7x***	
	Retail	0.9x***	Hybrid	2.4x	PECCS Value Chain
Transportation	1.4x***	Products	1.5x***		
		Services	1.9x		

Source: Calculated using more than 10k deals from PitchBook, CapitalIQ, Factset, and other primary sources between 1999-2022.

*** & ** indicate a significant mean difference with the rest of the population at the 1% & 10% levels, respectively.

In addition to these factors, we also include control variables that have statistical power in explaining the observed valuations. Table 4 summarises the control variables in our model, grouped into three categories, including the transaction characteristics (i.e., PE Deal Controls), PECCS® segments, and equity market controls.

TABLE 4: KEY CONTROL VARIABLES, THEIR EFFECT ON VALUATION, & THE ECONOMIC RATIONALE FOR INCLUDING THEM IN THE MODEL

Factor	Definition	Effect on price	Economic Rationale	References
PE Deal Controls	Deal Leverage	Positive	Companies that trade with deal leverage are considered better prospects and have a higher value	Jenskinson & Stucke (2011)
	Percentage Control	Negative	A higher control stake in an acquisition creates larger risks and decreases the price.	Renneboog and Simons (2005)
	Add-on	Negative	Add-on deals create new risks for investors including synergy risk.	Hammer et al. (2022)
PECCS Controls	Dummy variable for PECCS classes	Positive or Negative	Different segments of private markets exhibit different average level of price because of systematic difference in risk.	See PECCS documentation
Equity Market Controls	Listed Industry Valuations	Positive	Higher same-sector valuations in listed markets correlates with higher same-sector private market valuations.	Chan, Lakonishok & Swaminathan (2007)
	Residual Market Valuations	Positive	Higher listed market sentiment correlates with higher private market valuations	Bibo & Tian (2022)
	Fama French Value Factor Return	Positive or Negative	The returns of the value factor correlate with private market valuations: private company investments are also a Value play.	Fama & French (1992)

Source: Calculated using more than 10,000 deals from PitchBook, CapitalIQ, Factset, and other primary sources between 1999-2022.

Model set up

The privateMetrics asset pricing model uses the Price-to-Sales ratio of observable transactions (the entry price multiple) as the modeled 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.

$$\frac{P}{S} = \alpha + \sum_{k=2}^K \beta_k \lambda_k + \varepsilon$$

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

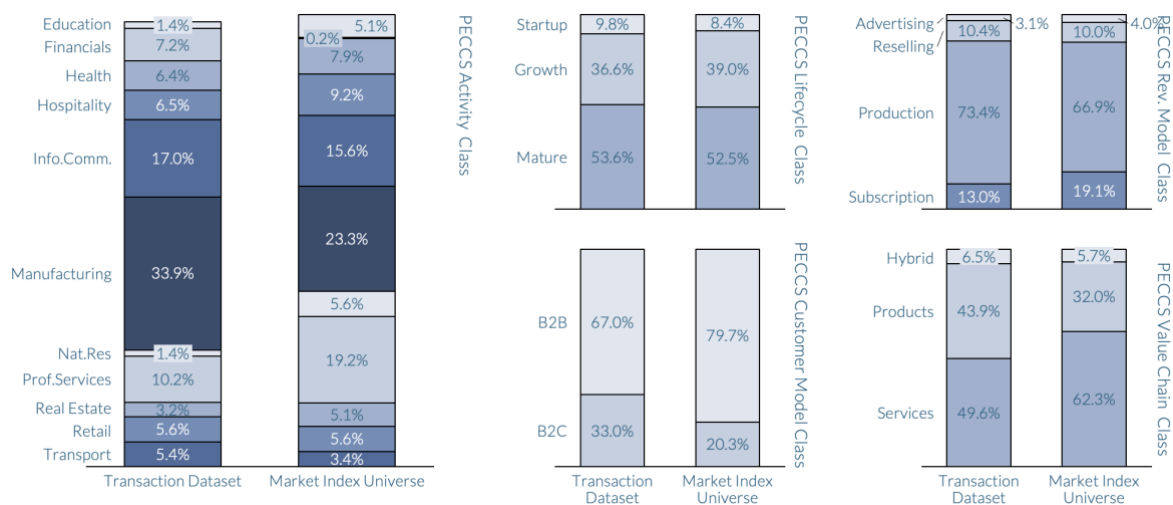
Model calibration

The privateMetrics model uses a carefully curated dataset of more than 10,000 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 λ s) through a dynamic estimation (using a Kalman filter), which retains the memory of past λ s while also allowing the new transaction to influence the relationship while keeping the average ε 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 Figure 1.

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 and 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



Model output

The output of the asset pricing model is an estimated P/S ratio for each observed transaction such that on average the estimated and observed values converge. To examine how closely the predicted valuations track the raw modeled valuations in transactions, we compute the moving average P/S (using median values) of all the data over the previous 12 months and plot the predicted and the raw series. For context, we also include the monthly P/S of key public market benchmarks. Figure 2 presents the results, and we can see that the moving average of the predicted valuations from the model very closely tracks the raw valuations, with the two series having a correlation coefficient of 0.98. Moreover, we also see that the average transaction at any point in time is also highly correlated with public market valuations, as indicated by a correlation coefficient of 0.79. Thus, Figure 2 is reassuring that the modeling does not introduce any mechanical artifacts in predicted valuation and is very well aligned with raw data.

FIGURE 2: MOVING AVERAGE PREDICTED VS RAW VALUATION AND PUBLIC MARKET VALUATION



Source: Calculated using more than 10,000 deals from PitchBook, CapitalIQ, Factset, and other primary sources between 1999-2022.

Model Robustness

How precise are the predictions across PECCS® pillars?

To examine how closely the predicted valuations track the raw modeled 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 $\pm 10\%$, 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, it is worth investigating whether or not our predictions for EV/EBITDA might be biased.

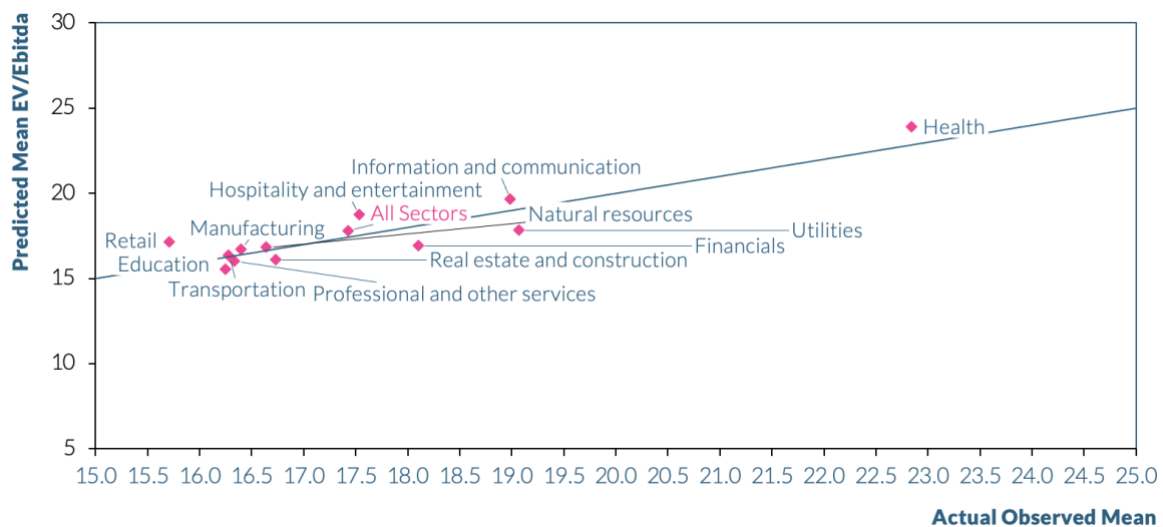
To ensure that is not the case, we compute the EV based on the book value of debt and predicted equity valuation and divide the sum by the EBITDA to get a predicted EV/EBITDA and compare it to transaction implied ratios. Figure 3 presents the average predicted and observed EV/EBITDA by PECCS® activity 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%	PECCS Customer Model
	Professional and other services	3.3%	B2B	1.5%	
	Real estate and construction	1.9%	B2C	0.9%	PECCS Value Chain
	Retail	0.5%	Hybrid	0.6%	
Transportation	7.2%	Products	1.1%		
Full Sample		1.1%	Services	3.4%	

Source: Calculated using more than 10,000 deals from PitchBook, CapitalIQ, Factset, and other primary sources between 1999-2022.

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



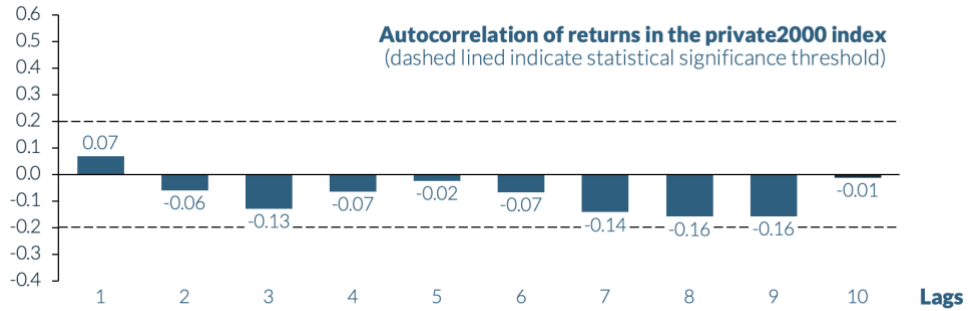
Source: Calculated using more than 10,000 deals from PitchBook, CapitalIQ, Factset, and other primary sources between 1999-2022.

How realistic are the results?

To assess how realistic the valuation from the shadow pricing exercise is, it would be useful to look at the return characteristics of an index constructed based on this methodology. Thus, we can look at the performance of the private2000® index constructed by Scientific Infra and Private Assets on these principles. A standard indication of ‘smoothed’ returns and the underestimation of volatility is the presence of autocorrelation in private asset return indices. In contrast, privateMetrics indices, such as the private2000®, exhibit no serial correlation, as shown in Figure 4. This demonstrates that they accurately capture the true risk of private markets.

Another way to look at the staleness is to compare the Sharpe ratio (excess returns per unit of risk) of different asset classes, based on appraised indices and the private2000® index. Indices with stale NAVs might show very low volatility and hence extremely high or even unrealistic Sharpe ratios.

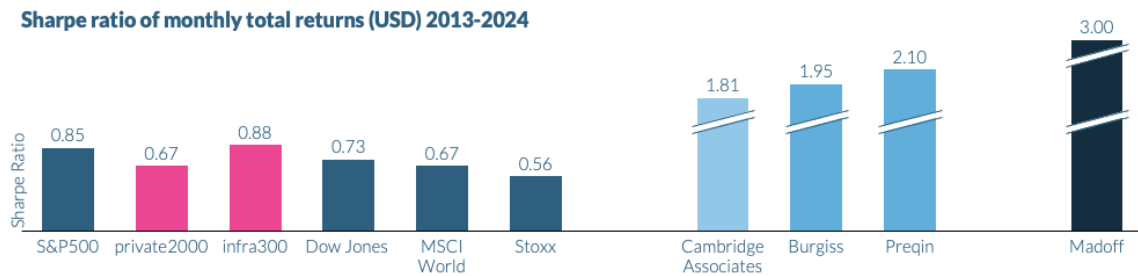
FIGURE 4: AUTOCORRELATION OF RETURNS IN THE PRIVATE2000 INDEX. THE DASHED LINES INDICATE STATISTICAL SIGNIFICANCE THRESHOLDS



Source: Scientific Infra and Private Assets' private2000 monthly index return data between 2013-2024.

In Figure 5, comparing the Sharpe ratios of public markets and different private market indices, this becomes evident. The Sharpe ratio of the private2000 index is 0.67, almost the same as that of the MSCI World Index. However, the appraisal-based private market indices (such as those of Cambridge Associates, Burgiss, or Preqin) have Sharpe ratios way over 1.5.

FIGURE 5: SHARPE RATIO OF MONTHLY TOTAL RETURNS (USD) 2013-2024 (RISK-FREE RATE = 1%)

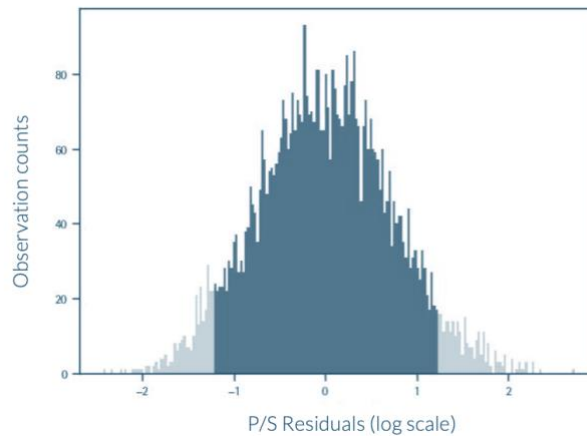


Source: Scientific Infra and Private Assets' private2000 & Infra300 monthly index return data between 2013-2024.

Model Residuals

Our factor model is constructed to capture the systematic effect of observable factors on valuation and leave out the idiosyncratic ‘noise’ in transactions. A diagnosis of residuals from the model can allow one to interpret whether or not that objective has been met. In Figure 6, we present the residuals from the model and can see that the average error in the model is centered around zero and, at least visually, the residuals look almost Gaussian, or in other words like ‘white noise’ – i.e. they have a zero mean, are symmetrical around the mean, and follow a normal distribution.

FIGURE 6: DISTRIBUTION OF MODEL RESIDUALS BASED ON A FACTOR MODEL OF LOG(P/S) USING TRANSACTION DATA



Source: Calculated using more than 10,000 deals from PitchBook, CapitalIQ, Factset, and other primary sources between 1999-2022

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