DOES SIZE MATTER?

A closer look at alpha across fund size

April 2025

Executive Summary

Small and Mega Private Equity Funds outperform. We analysed the performance of 586 buyout funds in the Americas, primarily U.S.-focused, spanning vintages from 2013 to 2023. Using privateMetrics® indices and the Excel plug-in tool, we calculated alpha performance across the fund universe. By segmenting funds into size buckets, we observe that smaller and lower mid-market funds achieved higher median IRRs and alpha. In the smallest bucket (<$500 million fund size), median alpha observed was +5.6%. At the top end of the market, mega buyout funds also produced positive alpha. Funds with greater than $5 billion of committed capital showed median positive alpha of 1.77%, displaying the benefits of scale at the very high end of the market. The upper middle market delivered the poorest results in our analysis for the Americas. For Europe we had a smaller sample (129 funds), and the performance was more mixed. Small and mid-market funds had higher median IRRs and alpha, while the mega buyout segment underperformed.

Dispersion narrows with size. More extreme positive alpha is observed in smaller funds. As fund sizes increase to $5 billion and beyond, extreme outperformance is less frequently observed but the overall return dispersion profile is narrower. Fewer outsized returns but also fewer major negative alpha funds. This is also true on the downside where more pronounced negative returns are observed in smaller funds. Median market return (beta) also declined as we moved from the smallest to largest size quartile, potentially indicating a difference in riskiness of the assets in small vs very large funds.

Systematic Risk Factors Explanation. Mega buyout funds pursue the largest transactions, which generally are less liquid and thus warrant a higher risk premium. This is balanced against the higher quality of businesses and greater leverage employed in very large transactions, signalling a lower risk asset. Small buyouts tend to be value-oriented investments with lower quality earnings, as evidenced by the significantly lower leverage levels employed in small buyout transactions. These characteristics would suggest higher risk premiums in this segment. The high dispersion in alpha also supports the idea of it being a riskier segment of the market.

Manager Incentives. The fee model in the private equity industry encourages managers to capitalise on success and scale by raising ever larger funds. Rather than executing more deals of the same size, the model encourages doing a similar number of deals of larger size to benefit from the increased scale. This leads to the most successful long-standing managers ending up in the mega cap space, after managing many funds of increasing size over time. This may also indicate that the mega cap universe is disproportionately represented by strong managers, partially explaining the performance at the top end of the market. Further, delivering alpha at scale is valuable as many institutions may not have the resources to comb the small cap market.

Methods And Tools

We utilised a funds database containing over 800 private equity fund cash flows for the 2013-2023 vintages. We then used the privateMetrics® indices to calculate alpha by employing the Private Market Equivalent (PtME) approach. Much like the public market equivalent (PME), fund cash flows were assumed invested in the private2000 index, matching the inflows and outflows of the underlying fund cash flows. We accomplished this using our Direct Alpha tool (here) and the privateMetrics Excel plug-in tool (here) which allows one to download the monthly index prices for the private2000 and various sub-indices. Each fund was evaluated first against the private2000® to calculate Total Alpha. Second, the fund was benchmarked against a thematic index reflecting the fund strategy to determine Pure Alpha, and then Allocation Alpha. As a reminder, we define the various components of fund IRR and alpha as follows:

Fund IRR = Market Return + Total Fund Alpha, where:

Total Fund Alpha = Allocation Alpha + Pure Alpha

Please see the appendix for a more detailed explanation of the calculation and method.

Fund size is assumed as a proxy for the size of assets in transactions. When private equity firms scale their fund size, typically they move 'up-market' and buy larger assets while keeping the total number of deals constant or only increasing modestly. This is consistent with the following study[1] (Braun et al., 2022). Often the managers move up market and then seed a new fund that targets the previous deal sizes. Mega funds, such as KKR's flagship, pursue the largest deals in the market. However, KKR, the company, has seeded many strategies to pursue mid-market or sector specific themes.

Prior Studies on Size and Performance

The most recent research on the relationship between size and performance in private equity was completed by Braun et al. in 2022, where this topic was analysed both at the asset and fund level. The researchers used the public market equivalent (PME) approach to assess gross value add (GVA) of managers. The report found that there was a negative relation between relative returns and both deal and fund sizes. The researchers used 942 buyout funds and over 13k deals for the time period 1974 to 2011. The research also found that there was higher dispersion among smaller funds that narrowed with increasing fund sizes. The research focused on GVA which combines the excess returns over a market index with the amount of dollars deployed. Thus, with this approach, a very large fund with modest alpha may have greater GVA than a small cap fund with much higher alpha. They also found that managers do not increase quantity of deals as fund size increases.

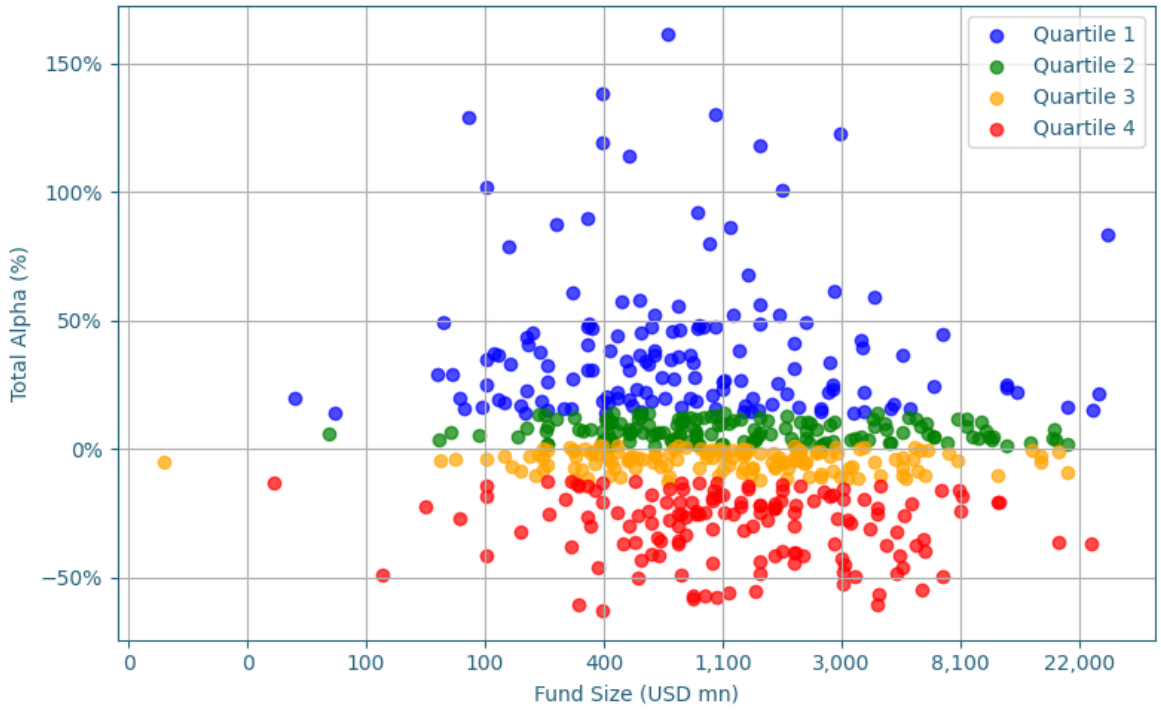
[1] Size, returns and performance persistence: Do private equity firms allocate capital according to individual skill? Braun, Dorau, Jenkinson, and Urban (2022)

Other research on this matter, including Kaplan and Schoar (2005) finds no impact of fund size on performance, using the public market equivalent (PME) for buyout funds.

Alpha by Fund Size

Figure 1 below outlines the total alpha for funds with vintages from 2013 to 2023, split into alpha quartiles. There are 586 Americas-focused funds across the vintages.

FIGURE 1: TOTAL ALPHA VS FUND SIZE – AMERICAS 2013-2023 VINTAGES



Source: privateMetrics

In this case, Quartile 1 (blue) represents the highest quartile alpha generators within the Americas fund universe, while Quartile 4 (red) represents the worst performing funds. As Figure 1 indicates, most of the extreme high alpha performing funds were smaller, typically less than $2 billion in size, with most less than $1 billion. This also appears true with the negative performance, where small to lower middle market funds in the 4th quartile of alpha producers showed more severe negative returns than mega buyout funds. Overall, the dispersion in alpha was narrower as fund sizes increased beyond $5 billion, indicating there may be differences in asset risk when comparing mega funds to the small and lower middle market segments.

Table 1 further breaks out the return and alpha metrics along 4 key size buckets. The first bucket consists of small funds with fund size under $500 million. Funds in this category would have completed very small buyout transactions. Assuming 10-20 deals per fund, average equity cheques would be ~$25-50 million per transaction. This bucket showed the highest median IRR and total alpha of the 4 buckets. It also had the highest market

component (beta) of the four buckets. Strategies in this segment may have a 'value' bent, thus accounting for the larger dispersion in returns. In other words, the assets overall may be riskier than larger size buckets.

Likewise, the 2nd bucket, comprised of funds with sizes between $500 million and $1 billion, showed the next strongest median IRR and alpha. Assets in this bucket share characteristics with the smallest funds. The upper middle market to large buyout segment ($1-$5Bn) funds showed the lowest median IRRs and alpha, while also showing very large dispersion. Conversely, the mega buyout category, funds in excess of $5 billion, showed better results with positive alpha.

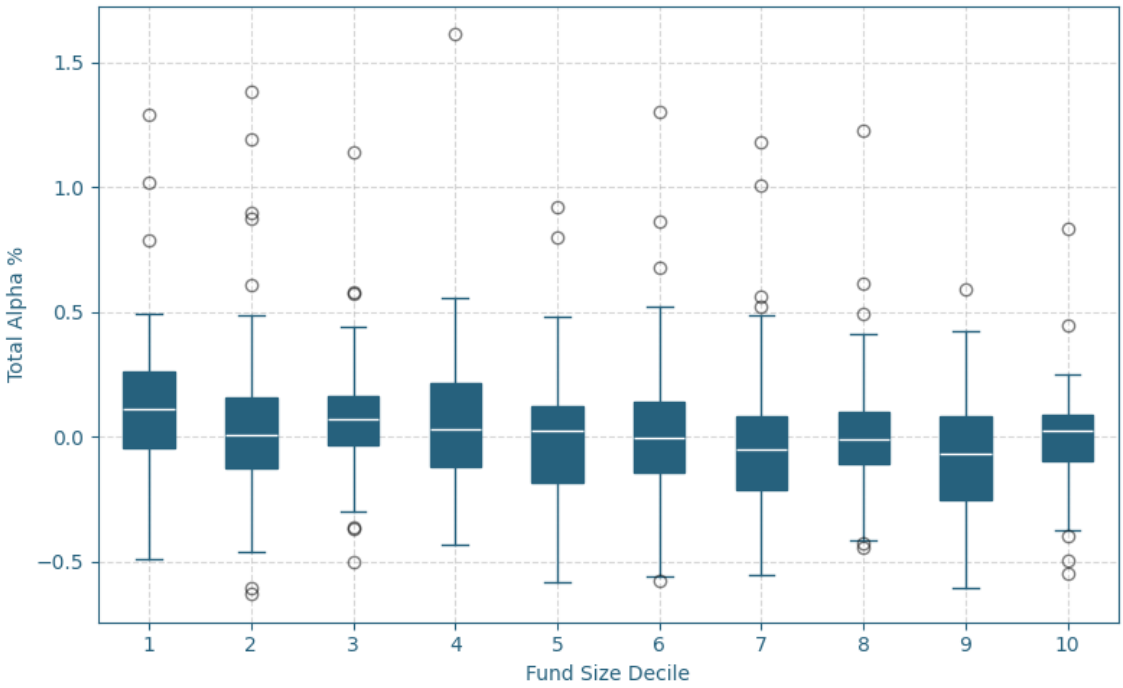
TABLE 1: IRR AND ALPHA BY SIZE IN AMERICAS 2013-2023 VINTAGE

Americas n=586 (2013-23 Vintage)		IRR			Total Alpha		
Size Buckets	Fund Size	Bottom Decile	Median	Top Decile	Bottom Decile	Median	Top Decile
1 (154)	<500Mn	-11.1%	21.3%	57.3%	-19.4%	5.56%	43.7%
2 (137)	500Mn-1Bn	-29.3%	16.9%	57.2%	-30.2%	3.68%	44.9%
3 (225)	1-5Bn	-32.5%	10.1%	39.9%	-36.9%	-1.56%	25.9%
4 (70)	>5Bn	-22.2%	13.5%	28.3%	-35.2%	1.77%	21.7%

Source: privateMetrics

Figure 2 below shows this at an even more granular level based on fund size deciles. The small and lower middle market segment showed more likelihood of positive alpha generation relative to the upper middle market (deciles 6-9). The mega funds in decile 10 (>$5 billion fund size) also showed positive median alpha. We can observe tighter dispersion in decile 10 relative to others, perhaps implying that the mega funds pursue lower risk assets. The performance of the upper mid-market and large segment (excluding mega funds) was the most surprising. While many champion these segments as the higher alpha potential parts of the market, our analysis finds that they underperformed the small, lower middle market and mega cap space.

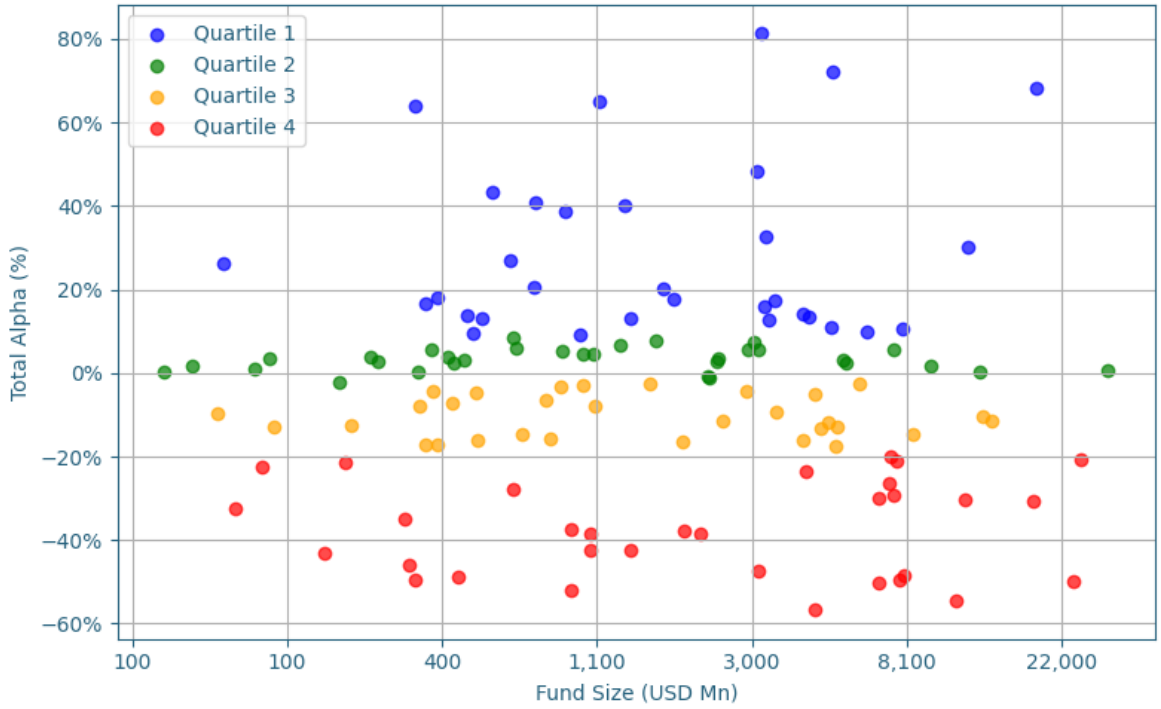
FIGURE 2: ALPHA BY FUND SIZE DECILE – AMERICAS 2013-2023 VINTAGES



Source: privateMetrics

Turning to Europe, Figure 3 below shows results across fund size and total alpha for 129 funds with vintages from 2013-2023. In this case negative results were more pronounced at larger fund sizes.

FIGURE 3: TOTAL ALPHA VS FUND SIZE – EUROPE 2013-2023 VINTAGES



Source: privateMetrics

Similar to the Americas focused funds, smaller European buyout funds show a large presence of significant outperformers, indicating higher chances of finding a 'homerun' fund. The mega fund segment (>$5 billion fund size) had noticeably poorer results than their US counterparts. We observe a large number of 3rd and 4th alpha quartile performers at the large end. The mid and upper middle market had relatively better performance

TABLE 2: IRR AND ALPHA BY SIZE QUARTILE IN EUROPE 2013-2023 VINTAGE

Europe n=129 (2013-23 Vintage)		IRR			Total Alpha		
Size Buckets	Fund Size	Bottom Decile	Median	Top Decile	Bottom Decile	Median	Top Decile
1 (35)	<500Mn	-25.5%	7.2%	30.0%	-43.2%	-2.13%	16.7%
2 (19)	500Mn-1Bn	-16.5%	21.0%	50.2%	-27.9%	6.03%	38.9%
3 (43)	1-5bBn	-34.2%	14.4%	44.8%	-38.4%	2.90%	32.7%
4 (32)	>5Bn	-44.7%	-3.6%	22.7%	-49.6%	-12.96%	10.9%

Source: privateMetrics

Manager Incentives, Fund Size, and Deal Size

As fund sizes increase, management fees and carried interest are surprisingly sticky, despite the gains from scale in the asset management industry. Typically, private equity funds charge 1.5-2% for management fees and 20% carried interest above an 8% hurdle. These fee levels do not change with fund size, with mega funds charging similar fee percentages as very small funds. According to research, the elasticity of management fees with respect to fund size is just -0.06 (Braun, Jenkinson 2022 and W Lim 2021).

This creates a massive incentive for managers to raise larger successor funds to scale and move up market, by executing large deals. If we view the management fee stream as an annuity and a higher degree of certainty, then the manager can significantly increase the value of the management company by increasing fund sizes. Smaller funds (e.g. below $300 million), likely need the management fees to fund operations, team expenses, with limited residual value to justify a large value for the manager. For the small fund, the carried interest represents the largest potential residual value. At the large and mega cap level, the management fees are far higher than what is required to run the day-to-day business. We can see the evidence of this in the listed private equity manager space, where valuations are primarily established from capitalised fee-related earnings, comprised mostly from management fees.

This greater importance of management fees as a component of manager value may drive mega funds to a less risky strategy. At small fund sizes, maximising the carry (call-option) is desirable, but at mega fund sizes, preserving the large management fee stream (bond-like) favours limiting volatility.[2]

Do the Best Managers Graduate to Mega Funds?

Related to the prior point, the managers that have scaled to the mega buyout space were all smaller funds at one point and delivered strong returns, attracted more capital and moved up market. There are fewer assets to chase but also far fewer players going after the assets. There are no ‘emerging’ mega cap managers. All have existed for decades and navigated their way up market over time. This may also partially explain the ability to generate alpha at scale. Moreover, they offer a valuable service to LPs, by providing access to the private equities market at scale. Some LPs that need to deploy larger allocations can achieve this efficiently with the mega cap managers. Not all LPs have the resources to research and evaluate the thousands of small cap managers in the market.

At the smaller end of the market, there will be a mix of new and emerging managers, as well as those not able to raise larger funds, due to performance or other reasons. It makes sense that the small end of the market sees high dispersion in results. Either they outperform and raise large successor funds, or they languish as small cap managers, with some ultimately failing to survive.

Systematic Risk Factors Explanation

Mega buyout funds pursue the largest companies in the private equities market. The companies tend to be more illiquid due to a more limited buyer pool, thus warranting a higher risk premium. Despite the smaller number of targets relative to the small cap market, there are a limited number of mega buyout funds with the capital to execute the largest transactions.

[2] Valuing Private Equity. Sorensen, Wang, Yang (2014)

Smaller company buyout transactions typically look more like value[3] (Chingono and Rasmussen, 2015), than growth investments. The company profile is usually mature rather than early stage. Value companies tend to trade at lower multiples and offer higher risk premiums, an explanation consistent with the alpha generation for the small cap segment. There may be more information asymmetries in smaller companies, increasing risk, contributing to higher dispersion. Further, given the scale benefits of larger deals, an investor willing to invest time and resources in the small cap space may be rewarded with higher returns. The greater dispersion of alpha (big winners and big losers) indicates the risk in the strategy, thus warranting a higher risk premium.

Smaller companies use considerably less leverage[4] than large and mega buyout transactions. Often there can be a 1.5-2x gap in debt/ebitda employed in small vs very large transactions. This is likely due to quality of the business and ability to service debt and thus signals that the smaller company should earn a higher risk premium due to its higher risk profile. Using the Comps Builder in privateMetrics, one can observe leverage levels covering various time periods, and across PECCS segments.

Please see the Appendix for a full description of the factor model and the common risk factors.

Conclusion

Using privateMetrics indices as benchmarks, we find that smaller U.S. buyout funds exhibit greater potential to generate outsized alpha, but they also carry a higher risk of delivering significantly negative alpha. This heightened volatility is influenced by systematic risk exposures and manager incentives that shape both asset selection and strategy. At the other end of the spectrum, mega-cap U.S. buyout managers have also demonstrated an ability to generate alpha—albeit at lower levels—though doing so at scale still translates into substantial dollar value for LPs. Consistent with prior research, we observe a negative relationship between fund size and performance, along with a narrowing of return dispersion. This may reflect a shift toward lower-risk assets and strategies as fund size increases. The difference in alpha may partly stem from greater inefficiencies in the smaller end of the market, where there are more companies and untapped opportunities to augment value. In contrast, LPs investing mainly in mega funds will likely track the broader private equity market, with less over/under performance.

[3] Leveraged Small Cap Equities. Chingono and Rasmussen (August 2015).
[4] Stepstone Group

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Index Catalogue

Browse our catalogue of hundreds of private equity, infrastructure and infra debt indices, inc. market indices like the infra300 and private2000, and thematic indices representing specific market segments.

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Query the PECCS® and TICCS® taxonomies used to create the privateMetrics universe. Access class codes, names and definitions to build your own index and comps customisations applications.

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Access a comprehensive set of performance and risk metrics for hundreds of private equity, infrastructure and infra debt indices tracking numerous geographies and segments.

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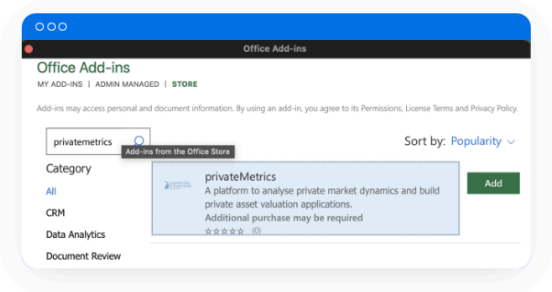
Yield Curves

Query risk-free rates for a given pricing and maturity date to support discounted cash flow (DCF) calculations, valuation models, and other financial analyses.



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Appendix

Direct Alpha Explanation

A simple way to the use a market benchmark to decompose the performance of private funds is the Direct Alpha approach of Gredil et al. (2021) by which a fund IRR can be written as:

$$Fund\ IRR = Market\ Return + Total\ Fund\ Alpha$$

The Direct Alpha calculations are described in the appendix.

Next, the alpha of each manager can be broken down into multiple sources. Fund managers generate alpha through a combination of strategic decision-making and execution capabilities. Broadly, these efforts fall into three categories: asset allocation, asset selection, and structuration. Asset allocation involves making strategic bets on different market segments, such as sector and geographic focus. Asset selection involves choosing specific investments and determining the optimal timing for distributions, aiming to maximise returns. Lastly, structuration includes adjusting leverage or reducing market risk through mechanisms such as preferential exit strategies, which can enhance returns while managing exposure.

We extend this approach to distinguish between sources of alpha. Using a broad market benchmark to measure Total Fund Alpha in combination with a strategy-specific benchmark e.g. mid-market US Tech, to control for the impact of Asset Allocation decisions, it is straightforward to split Total Fund Alpha into two components: Asset Allocation Alpha and Pure Alpha.

The difference between Total Fund Alpha and Pure Alpha is the Allocation Alpha,

$$Allocation\ Alpha = \text{Total Fund Alpha} - \text{Pure Alpha}$$

The total fund net IRR is written:

$$Fund\ net\ IRR = Market\ Return + Asset\ Allocation\ Alpha + Pure\ Alpha - Fees$$

Or

$$Fund\ net\ IRR = Market\ Return + Asset\ Allocation\ Alpha + Net\ Pure\ Alpha$$

Asset Allocation Alpha represents the portion of returns attributable to the fund manager's choice of market segment or style exposures (sectoral, geographic or factor tilts). Net Pure Alpha isolates the value added by the manager's investment selection and structuring skills, which includes timing of distributions, leverage decisions, and exit strategies, after fees. This shows how fund managers create value and enables investors to assess which proportion of market outperformance stems from specific strategic decisions or operational and investment expertise.

Calculating Alpha with privateMetrics

Approach

Compound the fund cash flows by the return of the private market index from the date of the cash flow to the calculation date. Then calculate the internal rate of return of the adjusted cash flows, which is the *Private Market Equivalent*. Inputs required: Fund's historical cash flows and NAV, Private Market Index

Step 1: Adjust the cash flows

$$\tilde{C}_t = C_t . \frac{V_b(T)}{V_b(t)}$$

C_t: Cash flow at time t (positive for distributions, negative for contributions)

$V_b(T)$: Value of the private market index on the calculation date T

$V_b(t)$: Value of the private market index at the initial time t

$\tilde{C}_t$: represents the adjusted fund cash flow

Step 2: Solve for the rate α equation linking the adjusted cash flows and the NAV:

$$\sum_{t=0}^{T} \frac{\tilde{C}_t}{(1+\alpha)^t} + \frac{NAV}{(1+\alpha)^T} = 0$$

α is the Direct Alpha rate (analogous to IRR). A *Private Market Equivalent* greater/lower than 0 indicates that the fund has outperformed or underperformed the private market index. We have made it easy to calculate alpha of a private equity or Infrastructure fund using the privateMetrics API and a pre-defined excel template. It involves three simple steps:

1. **Select the relevant broad market and strategy benchmarks:** Given a private fund, select a corresponding privateMetrics broad market index, for example the private2000 index for global private equities and a strategy index corresponding to the fund's style e.g., US Tech Mid-Cap.
2. **Get the fund data needed to compute Direct Alpha:** For the same fund, all historical cash flow and NAV data are required to apply the Direct Alpha methodology.
3. **Find Total Alpha, Style Alpha and Pure Alpha for the fund:** Using the two privateMetrics benchmarks selected above and the fund cash flow and NAV data, it is possible to compute Total Fund Alpha (relative to the Broad Market, Pure Alpha (relative to the Style Benchmark) and Style or Asset Allocation Alpha (the difference between Total and Pure Alpha)

Refer to this use case for more details.

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:

- **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 A1: 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 A1 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.

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

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.

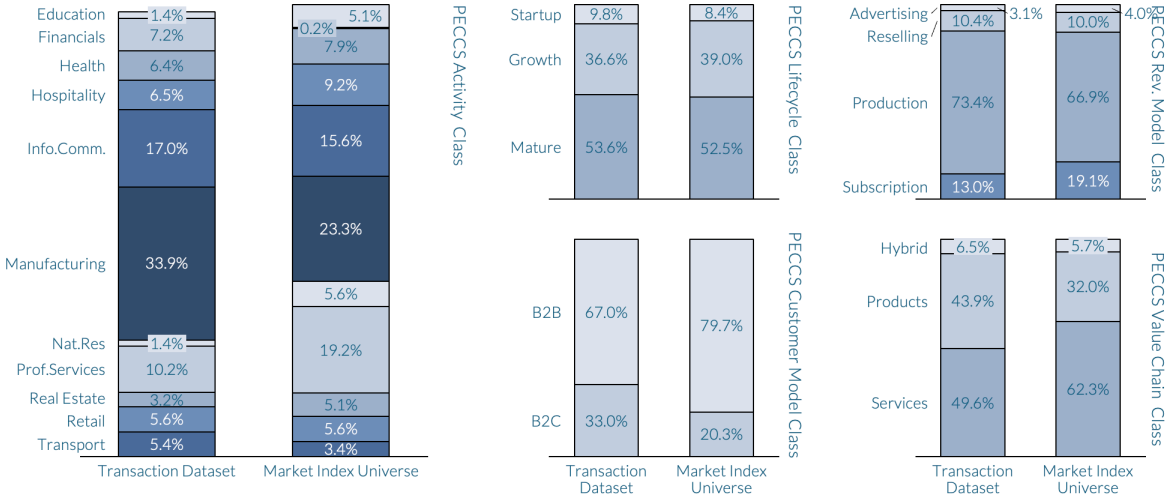
We calibrate this model using new observations monthly to update its estimation of the price of risk of each factor. In other words, each transaction observed is then used to 'update' this model (i.e., obtain new ls) through a dynamic estimation (using a Kalman filter), which retains the memory of past 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 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).

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 A2.

Figure A1: privateMetrics Transaction Dataset Compared to the privateMetrics index universe by PECCS pillar & class



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.

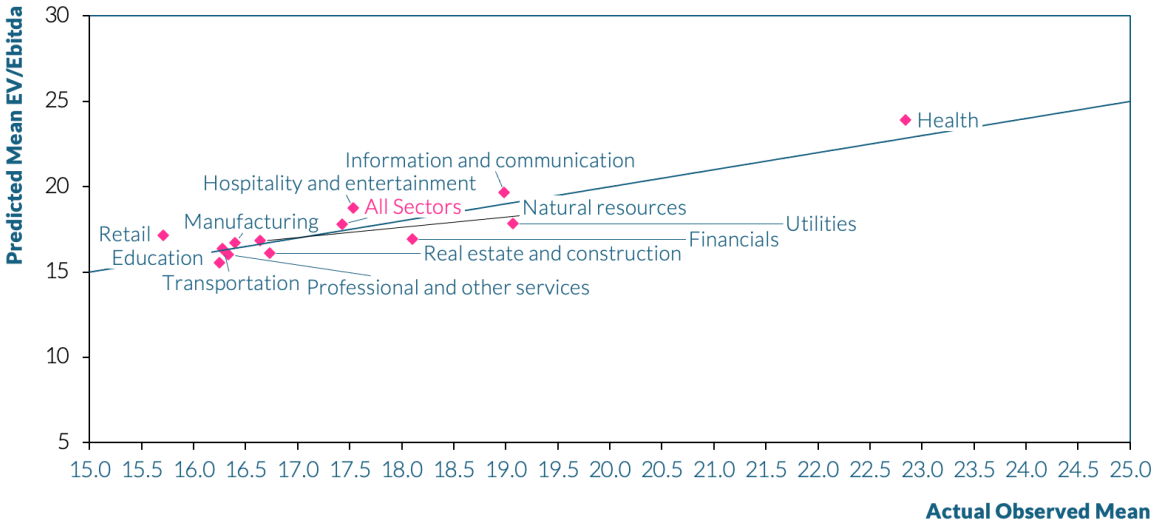
To ensure that is not the case, we compute the EV based on the book value of debt and predicted equity valuation and divide the sum by the EBITDA to get a predicted EV/EBITDA and compare it to transaction implied ratios. Figure A2 presents the average predicted and observed EV/EBITDA by PECCS® activity classes. We find that the predictions are very close to the observed values, thus mitigating this concern.

Table A2: 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 A2: 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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