NO ALPHA WITHOUT MARKET RISK

What if private equity fund managers were just long-only active managers?

February 2025

Executive Summary

Private equity fund managers can be described as long-only active managers whose returns are dictated from market exposure and active bets. The fund beta, rather than alpha, determines returns across private equity funds *on average*. This is consistent with the long-only mutual fund industry, where numerous studies have shown that most managers fail to outperform the benchmark (net of fees) for sustained periods[1]. From our analysis[2] of 824 buyout funds since 2013, the net median alpha is not statistically different than zero. About half outperform and half underperform. This should be no surprise given it is a mature and competitive market.

The private capital market is a ~$15 trillion AuM market, with over 50k deals completed in 2024 across buyouts, growth equity and venture capital, representing nearly $2 trillion of value[3]. It is no longer a cottage industry, but rather, a mature, institutionalised market driven by supply and demand forces, with tremendous annual activity across deals and fundraising. The underlying equities are risky, trade and price frequently, and experience volatility much like other asset classes.

Alpha can only be achieved by taking on market risk. Unlike in listed markets, alpha cannot be separated from beta in private equities. There is no 'short selling' or derivatives market to augment positions or neutralise market exposure. This means that to generate alpha, a fund manager needs to take meaningful private equities' market risk in pursuit of returns. Our analysis shows that private equity fund managers that generate alpha typically have betas to the private2000® index of at least 1.

Alpha can be measured. LPs seek private equity fund managers that generate alpha, however, often employ the incorrect methods or data. The fund manager should be evaluated against a private equities index such as the private2000 that reflects the underlying characteristics of the market. From this, one can evaluate how funds are performing against the relevant market, whether the manager has skill, or if most of their returns are determined by exposure to the market (see our paper). We explored this by reviewing the performance of two U.S. private equity managers, Francisco Partners and Clayton Dubilier & Rice.

Evidence of size effect. Our analysis of 824 buyout funds with vintages from 2013-2023 shows that there is a small negative relationship between fund size and alpha. Despite disproportionate success in raising capital, the very large funds (on average) do not display any superior ability to deliver alpha. Their fundraising success must then come from other considerations, including brand, relationships, ease of deploying large amounts of capital, and inertia.

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[1] Fama and French Study

[2] Do Private Assets Generate Alpha?

[3] McKinsey 2025 Global Private Capital Report

Private Equity Fund Managers are Active Managers

Private equity fund managers are active managers who principally take on market risk while making active bets across various sectors, segments, and individual companies. In this context, the "market" is not defined by a public equities index or a collection of fund managers' IRRs but rather by a representative and unbiased private equity index, such as the private2000. This index reflects the nature of the private equities market, incorporating deal activity, sector representation, business models, and pricing dynamics. Using a well-constructed, unbiased benchmark is essential for determining whether a manager's performance stems from genuine skill or merely broad market exposure. Given the high fees associated with private equity funds, making this distinction is critical.

As we show later in the report with Clayton Dubilier & Rice, a prominent U.S. buyout fund, investors in the fund are exposed to the underlying U.S. private equities market and the skill or alpha of the manager.

Much like active long only mutual funds, private equity funds can attempt to market time and select individual companies in pursuit of alpha. What distinguishes private equities from their listed counterparts are the additional levers available to the fund manager to generate alpha.

Capital Structure. A control investor in a private equity transaction can design and optimise the capital structure, often with significant leverage, to lower cost of capital, focus management, and limit the opportunities for poor allocation of capital.

Liquidation Preferences. The equity position in the company can have liquidation preferences upon sale or exit that favour and de-risk its position relative to other capital providers, including the management team.

Board Control. By controlling the Board of Directors, the private equity fund can monitor the progress and address issues in real time, including hiring/firing management.

Information Advantages. There are information advantages as private equity fund managers are closer to the company and not reliant on delayed/stale financials that may exclude material and useful information or metrics.

These considerations are why many consider the private equity ownership model to be a superior one to the public markets.

LPs broadly agree and have sought increasing exposure to fund managers over time. By investing in private equity funds, LPs are gaining exposure to market risk, but face other risks, including:

Market Risk. Exposure to the performance of the underlying private equities market.
Cash Flow Risk. Exposure to the level of contributions and distributions of the fund.
Liquidity Risk. Inability to redeem and pricing discounts in secondary markets.

The LPs, investing via a closed-end 10-year fund with no redemption options, have provided the GP with a valuable option to hold through market cycles or crisis. Unlike the mutual or hedge fund that must meet redemptions, there is no such option in the private equity vehicle, dampening volatility in periods of high market stress.

What is a Market?

The private equities market is a large, active, and expanding market with characteristics that can differ from listed equities. With an estimated $15 trillion in AuM and thousands of transactions annually, it is an established market. In 2024, over 50,000 deals were completed globally across buyouts, growth equity, and venture capital, totalling more than $2 trillion in value, while private equity funds raised approximately $589 billion[4].

Private equity is a subset of the broader private markets, which also includes non-GP participants such as corporates, SWFs, family offices, and other firms engaged in private asset transactions. As of 2022, 87% of U.S. companies with revenues exceeding $100 million were private[5]. This highlights a crucial reality: without active participation in private markets, investors miss exposure to a significant portion of the economy's leading companies.

How has the private equities market evolved?

Private equity is no longer a niche asset class. In the 1980s and 1990s, with support from forward-thinking U.S. endowments and high-net-worth individuals, private equity funds had the opportunity to acquire companies at 5-7x EBITDA (private2000 today – 14x! (unadjusted)), often using 50%+ leverage, while benefiting from ample structural and operational improvements. With fewer market participants and a vast opportunity set, the alpha available during this era was exceptionally high—one could, figuratively speaking, "drive a truck through it."

However, success attracts competition, and like other asset classes, private equity has since institutionalised at scale. The private equity market has evolved into a mature, highly competitive industry where generating alpha has become increasingly difficult. This is no different than other mature asset classes.

What influences market prices?

The private equity market is influenced by the macroeconomy, supply and demand dynamics, and the evolving appetite for private market exposure. Pricing and returns are shaped by the entry of new institutional investors, each bringing different risk tolerances and return requirements.

The Yale Model, pioneered by David Swensen, has been influential in inspiring institutions worldwide to increase allocations to private markets. As a result, new players—including pension funds, insurance companies, high-net-worth individuals, retail investors, and

[4] McKinsey 2025 Private Capital Report
[5] CAIA – The Rise of Total Portfolio Management

traditional asset managers—have entered the space. This influx of capital has led to lower return thresholds, intensifying competition and reshaping return expectations in the asset class.

Evidence from Mutual Funds

As the private equity market matures, a relevant comparison can be made to its long-only counterpart in listed equities. In public markets, long-only active managers justify their existence by taking active risk, deviating from their benchmark to seek excess returns. To assess a manager's performance relative to their benchmark, it is essential to evaluate whether the active returns generated are sufficient to compensate for the risk taken. The same principle applies to private equity, where investors must determine if the manager's returns compensate for the market risk (beta) and fee structure associated with the asset class.

The research on public equities managers is clear on this matter; Long only active managers fail to generate alpha on average over the long term. SPIVA[6] reports (S&P Dow Jones Indices) show that 80-90% of actively managed funds in the U.S. underperform their benchmarks over a 10-year period. This is the case across various strategies (Large Cap, Mid Cap, Small Cap). Similar results are obtained when looking at Europe. Short-term periods of alpha are rarely persistent and thus the main source of return for investors in long-only equity strategies remains beta. There have been numerous studies on this topic, including the 2010 Fama and French study[7] that show that most active managers underperform when adjusted for fees.

Logically, these results have led to the rise of low-cost index funds and the partitioning of alpha from beta. Beta is cheap and the main source of return, achieved primarily via low-cost index funds or derivatives. Alpha is pursued in non-correlated strategies often with very limited market exposure.

Private equities offer no such 'cheap' access to beta or market exposure. Participants must pay hefty fees to a GP (2/20) or go direct, which also has substantial costs. This has implications for the types of investors in the market. There are no passive flows in private equities. All GPs are active managers.

What Does the Private Equity Data Say?

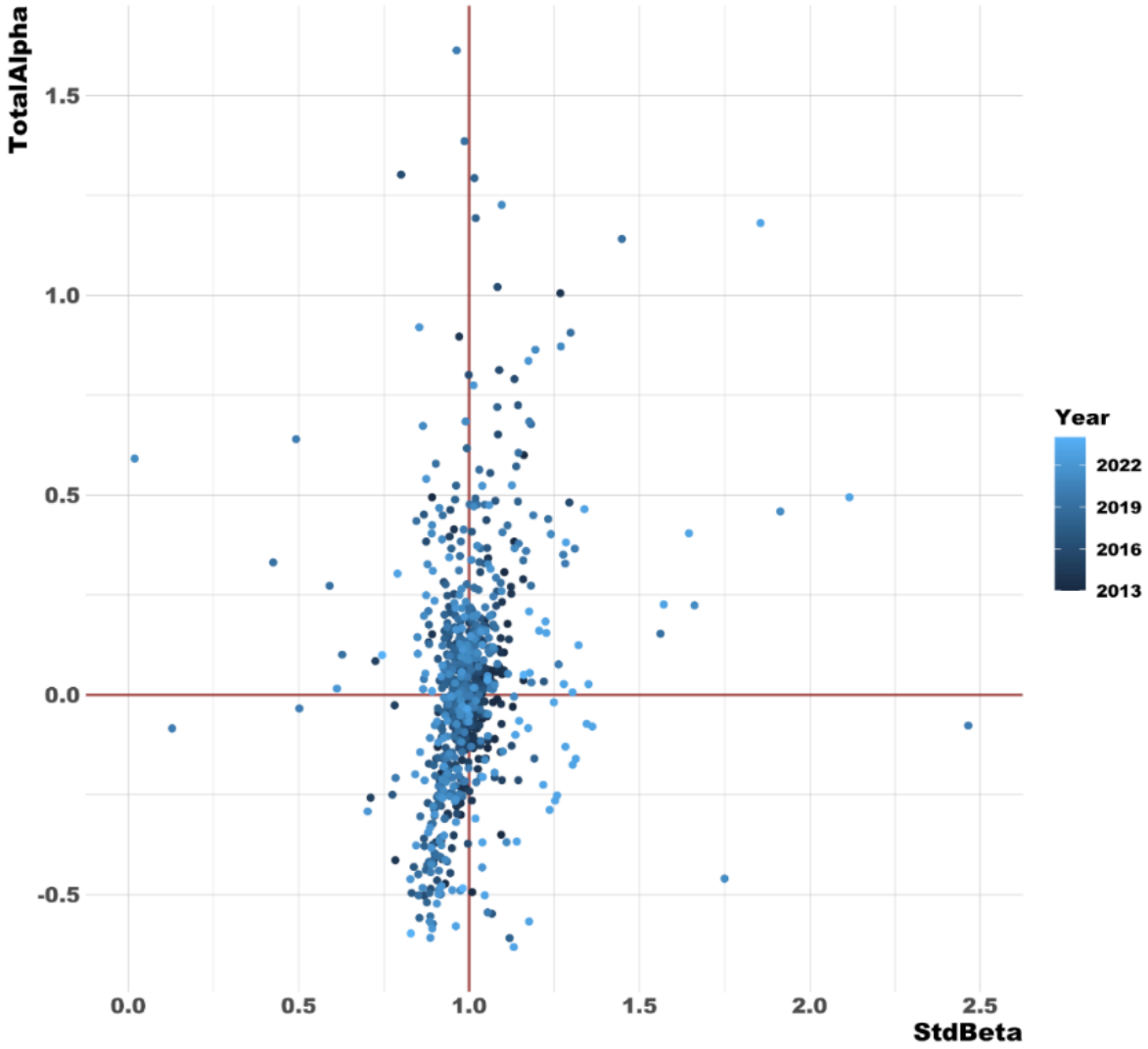
We analysed 824 private equity funds (non-VC) across vintages from 2013 to 2023 to evaluate the presence of alpha across funds and the relationship between alpha and beta. The funds represented approximately $2 trillion of AuM and were primarily North American (76%), with Europe (17%) and Asia (6%) accounting for the remainder. Roughly half of the funds delivered positive alpha while the remainder produced negative alpha, with median alpha very close to 0.

[6] SPIVA

[7] Fama and French Study

Most of the funds generating alpha had significant market exposure, with betas approaching 1 or greater. This provides support to the idea that positive relationship between alpha and beta. The data was consistent across vintages. Figure 1 below outlines the relationship between alpha and beta across four vintages.

FIGURE 1: BUYOUT FUNDS BETA VS ALPHA BY VINTAGE



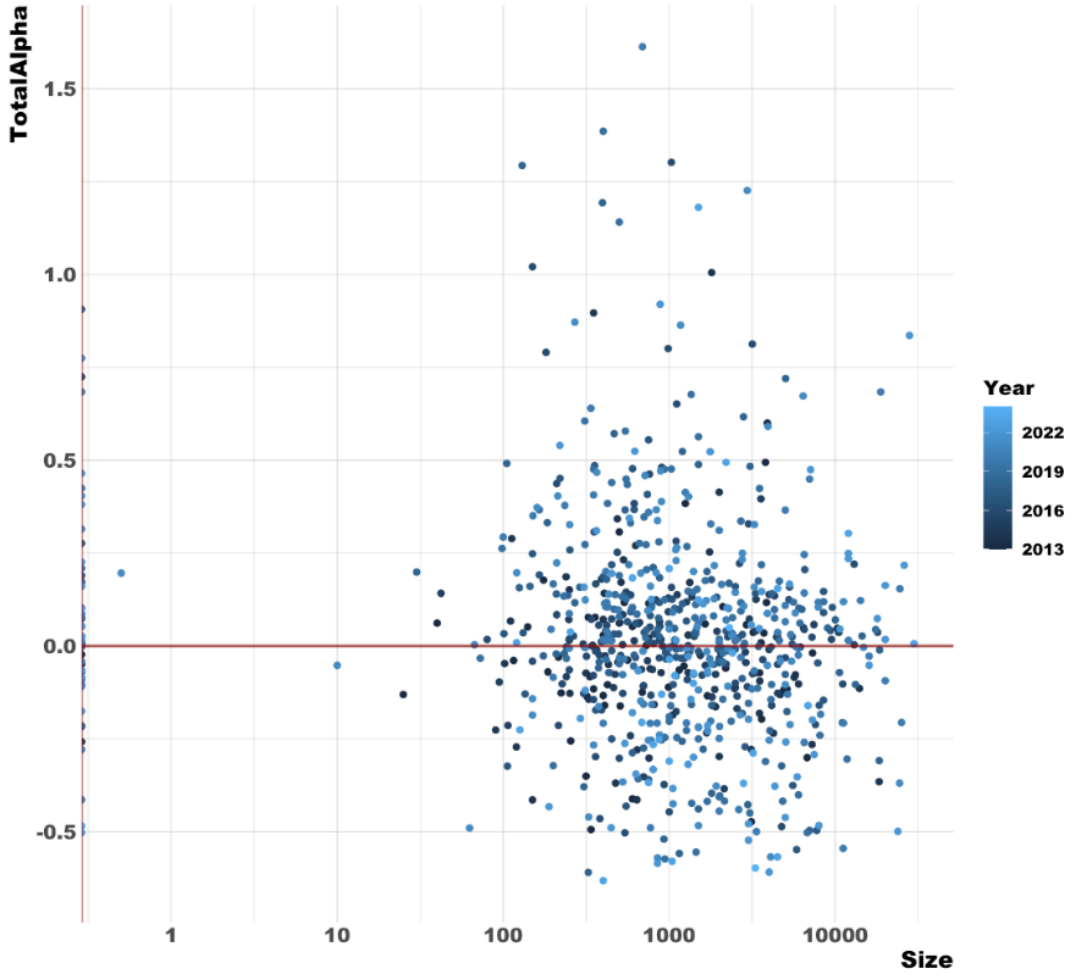
Source: Sipametrics

While there are a small number of low beta/positive alpha funds among the 800+ funds, there are significantly more funds with greater market exposure (higher betas) that have delivered alpha. Conversely, a disproportionate number of funds with betas < 1 showed negative alpha.

Investors in private equity funds are exposed to meaningful market risk as GPs must take on market risk to achieve returns (both alpha and beta).

Figure 2 below plots alpha by fund size across 4 vintages. At first blush, it appears that there is no discernible difference across fund size.

FIGURE 2: BUYOUT FUNDS FUND SIZE VS ALPHA BY VINTAGE



Source: privateMetrics®

Upon closer inspection, we observed a small negative relationship between fund size and alpha[8]. Table 1 shows the results of the regression, where current fund alpha (dependent variable) is regressed on prior fund alpha, market return, and fund size (log scale). This reinforces the idea that at large fund sizes, it is increasingly difficult for fund managers to sustain their competitive edge, or alpha.

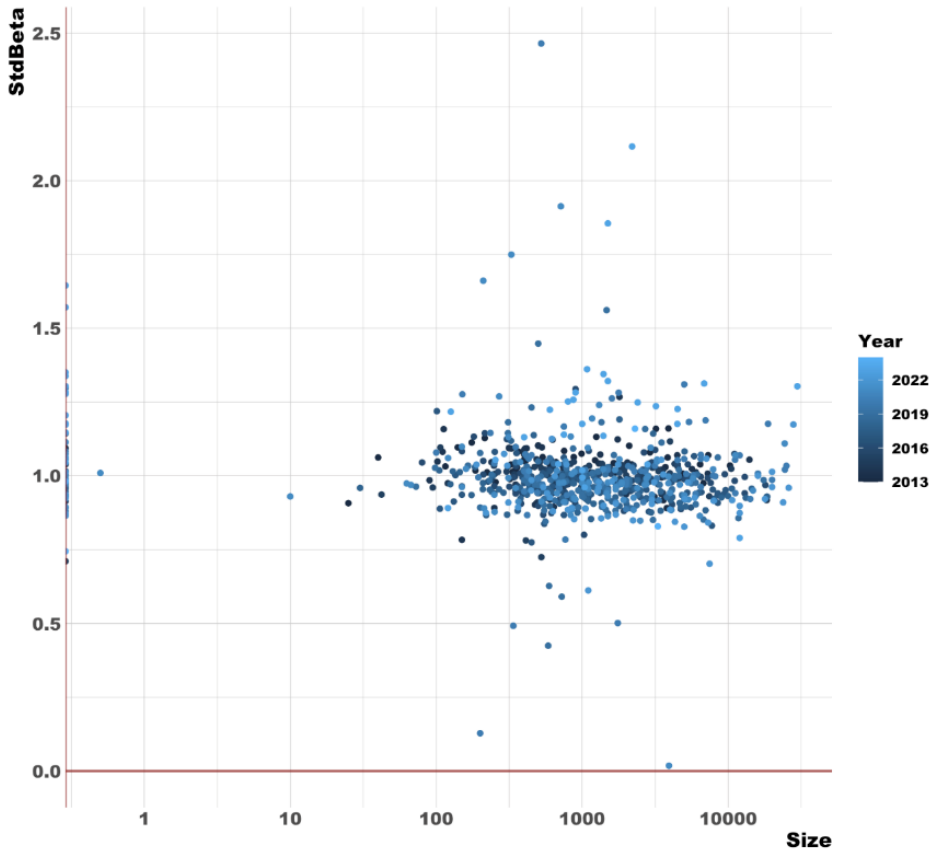
TABLE 1: REGRESSION RESULTS OF ALPHA AGAINST MARKET RETURN, PRIOR ALPHA AND SIZE.

	Estimate	Std. Error	t value	Pr(>|t|)	Significance
Alpha (t-1)	0.112472	0.060782	1.85	0.06540	.
Market Return	1.928218	0.251259	7.674	0.00000	***
Size_log	-0.022918	0.003787	-6.052	0.00000	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
R^2: 0.198

There was no obvious pattern between fund size and beta. Small, mid, and large cap managers display similar market exposures. This can be observed in Figure 3 below.

FIGURE 3: BUYOUT FUNDS BETA VS FUND SIZE BY VINTAGE



Source: privateMetrics®

[8] Regression results included 259 buyout funds that had at least 2 funds for vintages 2013-2023.

In addition to the aggregate results across 800+ funds, this analysis can be extended to the individual fund or manager level. In the following section, we analyse the beta and alpha contribution of two leading US private equity managers, Francisco Partners and Clayton Dubilier & Rice.

Francisco Partners and Tech Buyouts

Francisco Partners, based in the U.S., was one of the early players in the tech buyout space. They were formed in early 2000s when doing tech buyouts was not in the lexicon of most private equity firms. Given the strength of the tech space and the increasing presence of tech in PE portfolios, we reviewed 3 of their funds, including two of their flagship buyout funds, and one small buyout fund (Francisco Agility).

TABLE 2: FRANCISCO PARTNERS PERFORMANCE

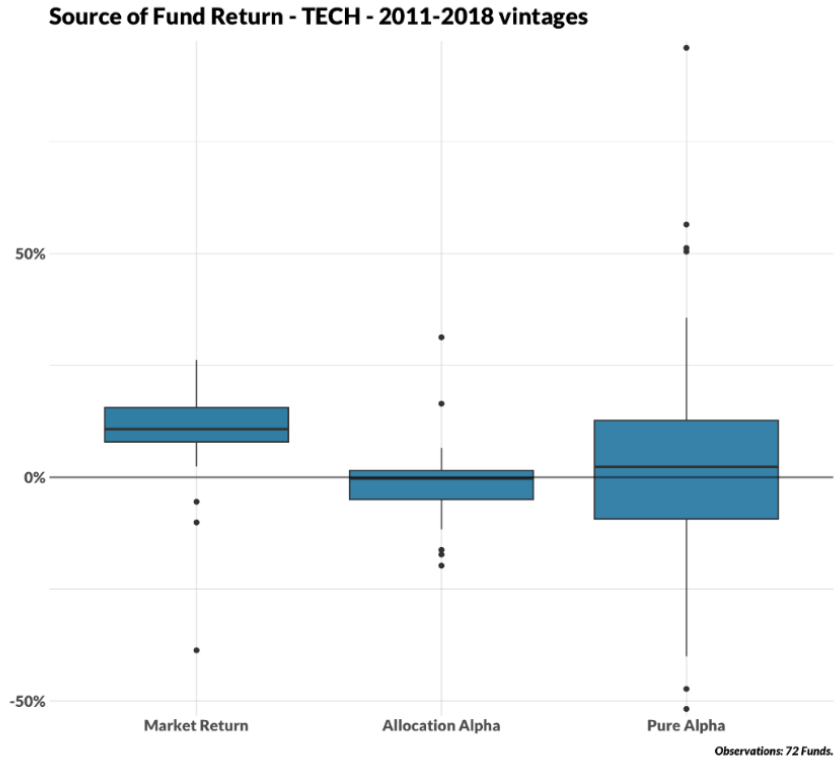
Fund	Vintage	Size(Mn)	IRR	TVPI	Total Alpha	Allocation Alpha	Pure Alpha	Market Return
Francisco Partners IV	2015	2,875	17.4%	2.02	-1.6%	0.7%	-2.4%	19.0%
Francisco Partners V	2018	4,035	-14.8%	0.52	-22.8%	-0.3%	-22.4%	8.0%
Francisco Partners Agility	2017	615	57.4%	5.08	36.7%	1.1%	35.7%	20.7%

Source: privateMetrics®

Francisco Partners IV, a $2.875bn fund, generated very solid headline returns in its 2015 vintage with an IRR of 17.4% and a TVPI of over 2x. But once controlling for the performance of the market, the alpha was slightly negative at 1.6%. In other words, the principal driver of returns was the rising tide in the technology sector. When benchmarked against the PEU Americas Information and Communication activity class, pure or selection alpha was negative 2.4%, slightly offset by allocation alpha.

Francisco Partners Agility was a small ($615mn) buyout fund raised to target smaller deals than the flagship fund pursues. The returns on this fund were a homerun, with a 5x TVPI and a 57.4% IRR. Though the market was strong, this fund still delivered a massive 37% alpha. Moreover, pure or selection alpha accounted for almost all the alpha, showing the fund manager's ability to pick winners.

FIGURE 3: BUYOUT FUNDS BETA VS FUND SIZE BY VINTAGE



Source: privateMetrics®

Francisco Partners V had a less successful outcome than the other two funds, with a negative 14.8% IRR, low TVPI and meaningfully negative selection alpha despite a positive market return.

The results across funds highlight the importance of the underlying private equities market in driving returns. The alpha can swing from positive to negative from fund to fund, making it difficult to predict persistence.

We also looked at this data across 72 tech funds with vintages from 2011-2018 and found that the market return was the greatest driver of performance. As Figure 3 shows, the tech market return was the largest source of returns followed by a small contribution from pure alpha and limited contribution from allocation alpha. This makes sense in a hotter market that is attracting capital, driving up valuations across the entire sector. A rising tide lifts all boats.

Clayton Dubilier & Rice

Clayton Dubilier and Rice ("CD&R") is a storied U.S. buyout firm that is known for making use of operational value add as a key differentiator of its strategy and returns. The fund performance and alpha generation is in Table 3 below. Does it translate to alpha?

TABLE 3: CLAYTON DUBILIER AND RICE PERFORMANCE

Fund	Vintage	Size(Mn)	IRR	TVPI	Total Alpha	Allocation Alpha	Pure Alpha	Market Return
CD&R IX	2013	6,437	23.0%	2.36	4.9%	8.4%	-3.5%	18.1%
CD&R X	2017	9,350	15.1%	1.52	4.2%	4.4%	-0.2%	10.9%
CD&R XI	2020	16,000	6.8%	1.08	-2.7%	-2.8%	0.1%	9.5%

Source: privateMetrics®

CD&R IX, a $6.5bn, 2013 vintage fund generated a 23% IRR and a TVPI of close to 2.4x. From Table 2 above, the exposure to the market contributed 18.1% of the 23% IRR. Investors in this fund gained exposure primarily to the private equities market in the U.S., while further benefitting from manager skill via alpha. Even in a very successful fund, this contrasts with the common view that private equity fund returns are largely from manager skill. There is an underlying private equities market with risk premia that are harvested by investors.

CD&R X, a $9.35bn, 2017 vintage fund generated a lower IRR (15.1%), but the overall market was not as strong, leaving alpha (4.2%) at similar levels to Fund IX.

Conclusion

Private equity fund managers are active managers that generate returns by taking on; 1) market risk (beta) and 2) making sector or selection bets (alpha). Like long only strategies in other asset classes, investors are largely compensated for bearing systematic risk. Private equity fund managers can augment returns through timing, selection, and structuring, or in other words, through manager skill. The market exposure an investor is getting is the private equities market, not to be confused with public indices or manager benchmarks. Given the size and scope of the market, the declining number and breadth of public companies, private equities market exposure is desirable.

Based on our review of over 800 buyout funds, managers need to take on meaningful market risk to deliver alpha. Nonetheless, given the maturity of the market, at least half of the managers still failed to deliver positive alpha.

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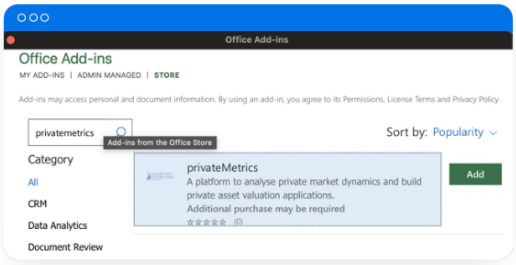
Query risk-free rates for a given pricing and maturity date to support discounted cash flow (DCF) calculations, valuation models, and other financial analyses.



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Appendix

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.

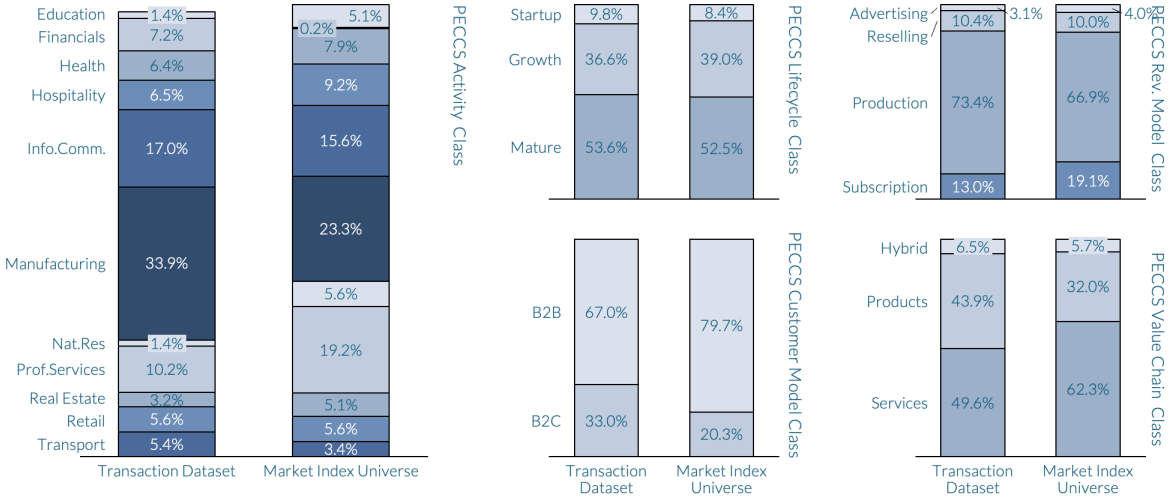
We calibrate this model using new observations monthly to update its estimation of the price of risk of each factor. In other words, each transaction observed is then used to 'update' this model (i.e., obtain new ls) through a dynamic estimation (using a Kalman filter), which retains the memory of past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

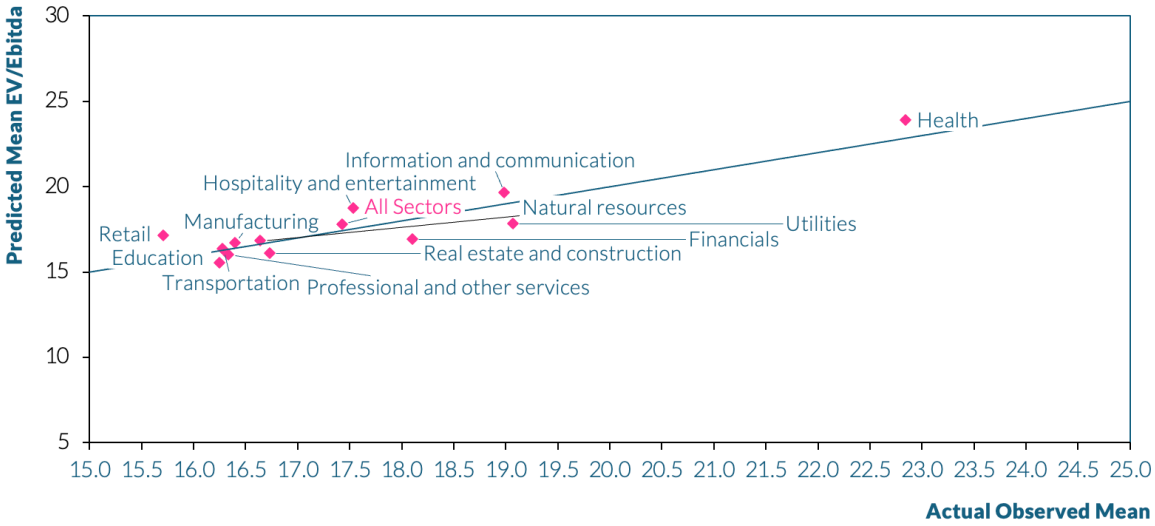
To ensure that is not the case, we compute the EV based on the book value of debt and predicted equity valuation and divide the sum by the EBITDA to get a predicted EV/EBITDA and compare it to transaction implied ratios. Figure A2 presents the average predicted and observed EV/EBITDA by PECCS® activity 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

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.

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