

# **Private Equity Funds' Performance, Risk and Selection**

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## **Abstract**

We review the literature on the risks and returns of private equity funds, comparing the different datasets used in academic research. Irrespective of the datasets used, average returns seem to be lower than public equity returns and, in any event, less spectacular than often conjectured. Buyout funds seem to bear a moderate market risk (beta is around unity), but their exposure to liquidity risk and distress risk is significant. The cost of capital of buyout is 18% (in excess of risk-free rate). The beta of venture capital seems much higher (around 3), implying a cost of capital of about 20% (in excess of risk-free rate and any venture capital liquidity risk premium). We conjecture on why industry benchmarks show different returns than those documented here. Finally, we discuss fund selection. We emphasize the importance of a bottom-up approach when investing in private equity, show that top-quartile returns and evidence of performance persistence should be approached with some caveats in mind, and describe variables that have predicted returns.

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## Introduction

The purpose of this chapter is to assess the risks and returns of private equity funds, based on the different datasets used in the literature and to point out some issues in fund selection.

This chapter is divided into *two* main sections, namely private equity fund risk and return; and private equity fund selection. The first section provides an overview of the academic evidence on the risk and return of investing in private equity funds (buyout and venture capital). We find that the average private equity fund return is comparable or inferior to that of public equity, a finding that is in sharp contrast to what industry associations report. We show that differences in methodology may explain, in part, this paradox. We also find that venture capital funds have market betas close to 3, whilst buyout funds have lower market betas (around 1), but are also exposed to liquidity and distress risks. Estimates of cost of capital are around 20% (in excess of risk-free rate) for both buyout and venture capital funds. The different approaches to estimating risk are also explained. The second section is dedicated to fund selection. Capital flows from investors are good vintage-year return predictors. Years of large inflows have poorer returns. Performance persistence is also documented and new evidence is presented, pointing to the conclusion that investors may have difficulties exploiting return persistence as this is too short-lived. Finally we report that the most important explanatory variable for the cross section of buyout returns is the number of investments a private equity firm is holding at the same time.

In terms of vocabulary convention, the term ‘(portfolio) company’ shall refer, throughout, to an entity receiving financing from a private equity fund, while the term ‘private equity firm’ shall refer to an organization running private equity funds (e.g. KKR).<sup>i</sup>

# **1 Private Equity Funds Performance and Risk Exposures**

## **1.1 Past Academic Evidence on Performance with Thomson Data**

The *Thomson* cash flow dataset was used until 2009 to generate the industry's performance report. *Thomson* would generate aggregate performance figures over various horizons, while industry associations, such as the National Venture Capital Association (NVCA), would issue press releases discussing these benchmarks. Financial newspapers would then widely propagate these numbers.

*Thomson* obtains data mostly from fund investors. In principle, these cash flows should represent the amount and timing of all the cash transfers to/from investors, including fees. Kaplan and Schoar (2005) and Phalippou and Gottschalg (2009) had access to the *Thomson* database. Kaplan and Schoar (2005) reported that buyout funds had returns below those of the S&P 500, while venture capital funds had returns slightly above those of the S&P 500. Phalippou and Gottschalg (2009) argued otherwise: they found that the net asset value (NAV) reported by mature and inactive funds were suspiciously high. They also noted that a number of mature funds (i.e. those that had reached their 10<sup>th</sup> year anniversary) had no cash flow activities for two years or more (most of them for 6 years or more) and reported the exact same NAV every quarter over the last two years or more (most of them over the last 6 years or more). In addition, those funds were those performing worse. In light of the above pattern, they argued that it was more reasonable to write-off those NAVs.<sup>ii</sup> Phalippou and Gottschalg (2009) also showed that different aggregation choices and sampling choices lead to findings of lower returns.

In addition, Phalippou and Gottschalg (2009) assessed a lower bound to the sample selection bias. Investors providing data to *Thomson* may have fund selection capabilities, as

a result of which the performance resulting from this dataset may be exaggerated. Using a wider sample of funds, Phalippou and Gottschalg (2009) found that the funds in the *Thomson* dataset were indeed slightly above average.<sup>iii</sup> With all these considerations in mind, they found that returns for both buyout and venture capital funds were below those of the S&P 500 index.

## **1.2 Past Academic Evidence on Risk Exposure with Thomson Data**

It can be argued that past performance cannot be verified with a high degree of certainty due to data limitations and, to some extent, because of the lack of a commonly accepted methodology. But even if one knew exactly what past performance was, this knowledge would not be helpful without knowledge of the risks associated to it. But risk is even more difficult to quantify than returns. Yet, recent research *has* developed some tools and methodologies. In this section, we examine one of these tools and methodologies, developed by Driessen, Lin and Phalippou (2009) and applied to *Thomson* data.

The idea is that with the right asset pricing model and, therefore, with the right alpha and betas, the expected net present value of private equity cash flows (investments and dividends) should be zero. So we assume an asset pricing model and search for the alpha and betas that are most consistent with expected net present value of cash flows be zero. Later in this Chapter, we cover other tools applied to other datasets but all these methods rely on this basic idea.

Driessen, Lin and Phalippou (2009) have used a “Method of Moment”. A method of moment is somewhat natural in this context since one needs to look for the alphas and betas that make the expected value of a variable equal to zero. This, however, is a method that

needs to be adapted to the particularities of the data: the highly idiosyncratic risk of private equity investments calls for forming portfolios. In addition, the identification of alpha and betas comes from observing funds alive at different moments in time, meaning that portfolios should not mix funds alive at different moments in time. Driessen et al. (2009), therefore, create portfolios of funds based on fund vintage years (i.e. starting years). They also propose a transformation of the moment conditions that minimizes small sample biases.

For venture capital funds, Driessen et al. (2009) find a market beta of around 3 and a negative alpha. In addition, they simulate a typical fee structure, quantifying the effect of the non-linear fee structure on beta. They find that, after fees, beta is smaller. This is due to the fact that fees are convex in performance, thus smoothing the pay-offs. A smaller beta, in turn, makes alpha higher. It follows that, while fees are about 6% per year, the difference between pre-fees alpha and post-fees alpha is only 4% per annum. For buyout funds, Driessen et al. (2009) find a market beta close to one. However, their small buyout sample means that the interval of confidence around this estimate is relatively large.

### **1.3 Recent Evidence on Performance with *Thomson* Data**

The two academic studies mentioned in section 1.1 have a sample that stops in 2001 and 2003, respectively. Given the strong growth in the private equity asset class and the fact that one needs to wait at least 10 years before a final performance number becomes available, there is an obvious need for an updated report.

Table 1 shows performance statistics for buyout funds from *Thomson* as of December 2007.<sup>iv</sup> Panel A shows results for all funds raised between 1980 and 1997 (US

and Europe). The first line shows the cash flows they generated in 2003 and the Net Asset Value (NAV) at the end of year 2003.<sup>v</sup> The second line shows the cash flows they generated in 2007 and their NAV at the end of 2007. Next, we show the sum of the cash flows across time. The 453 funds in the sample invested a total of \$149 billion, distributed a total of \$217 billion (\$203 billion in cash and \$14 billion in stocks) and valued all on-going investments at \$42 billion at the end of 2007.

**Table 1: Buyout funds - Thomson Summary Cash Flow Data**

This table shows buyout funds cash flow statistics from Thomson in the years 2003 and 2007. Performance is as of December 2007. The total amount invested (Cash in), distributed in cash or in stock (cash out, stock out) and Net Asset Value at the end of the year are all in million of U.S. dollars. The total is taken over all the years (1980-2007). Multiple is the total value distributed divided by amount invested. All figures are net of fees. Ever green and mezzanine are excluded.

Panel A: Buyout funds raised from 1980 to 1997

Year	N	Cash in	Cash out	Stock out	NAV	Total
...						
2003	453	1089	9917	350	70,068	n.m.
...						
2007	453	84	3830	103	41,598	n.m.
Total		148,694	202,927	13,944	41,598	258,469
Multiples			1.36	0.09	0.28	1.74

Panel B: Buyout funds raised from 1980 to 1993

Year	N	Cash in	Cash out	Stock out	NAV	Total
...						
2003	246	22	886	63	13,452	n.m.
...						
2007	246	0	176	47	10,465	n.m.
Total		60,447	103,650	9,458	10,465	123,573
Multiples			1.71	0.16	0.17	2.04

Here, we only have one performance measure available, namely a cash multiple (i.e. the total amount distributed divided by the total amount invested); this is displayed in the last line. The realized multiple is 1.45, which is likely to be less than public markets.<sup>vi</sup> However, it is reported that there is still a substantial amount of on-going investments, the

total value of which is measured by the funds' NAV as of December 2007. The final NAV is about 30% of the amount invested, which appears quite high given that these funds are 10 years or older. If we were to add these NAVs to the total distributed, the (total) multiple would be 1.74. But, even then, an investment that returns only 6% per annum for ten years would have a cash multiple higher than 1.74.<sup>vii</sup>

These results are consistent with previous research despite the fact that the sample has doubled with the passage of time, with performance appearing to be close or below that of public equity. In addition, a substantial part of the performance of these mature funds is supposed to yet be realized since the latest reported NAV is relatively high.

Panel B shows funds covered by Phalippou and Gottschalg (2009), i.e. funds raised between 1980 and 1993. A polemical aspect of the Phalippou and Gottschalg (2009) study was the choice of writing-off the NAVs of mature and inactive funds. This choice was justified by the fact that, for most of these funds, the same NAV was repeated for many quarters/years without any cash flow activity. Hence, the authors considered that what this entails is that the relevant fund is effectively liquidated and has no valuable investments. It is therefore interesting to see how much cash was actually paid out of these on-going investments after the end of their sample time period. Panel B shows the \$13 billion NAV reported as of the end of 2003, which was written-off by Phalippou and Gottschalg (2009). Four years later, this NAV amount has hardly changed and hardly any cash had been paid in the meantime. This would confirm the idea defended by Phalippou and Gottschalg (2009) that these investments are so-called 'living-deads.' They keep on repeating the same NAV but no cash flow is coming out.

Another possibility is that *Thomson* data are fraught with a flaw. The worse kind would be that *Thomson* may not have cash-flow reports for some funds. For example,

assume that for fund  $i = 1, \dots, N$  Thomson stops receiving cash flow information at date  $T_i$  and thereafter they report for every quarter  $t$  that  $\text{NAV}(t)$  equals  $\text{NAV}(T_i)$ . If that is the case, then performance derived from this database is most likely underestimated. This is because investments tend to happen in the early years of a fund (and are therefore more likely to be recorded) while dividends tend to happen in the later years of a fund (and are therefore more likely to be distributed after date  $T_i$ , being thus omitted). As Thomson provides no description of how they maintain their dataset, it is very difficult to determine whether or not performance is, indeed, underestimated.

## 1.4 Other Datasets and Evidence

As mentioned above, the main dataset used in previous research (Thomson's) might not be accurate. It is thus important to use other datasets to compare results. This is what we do in this sub-section. We cover the datasets of CEPRES, Preqin, some (academic) proprietary datasets, SandHill, and those of publicly listed vehicles.

### 1.4.1 CEPRES

The Center for Private Equity Research (CEPRES) offers a dataset giving the cash flows generated by a General Partner (i.e. the private equity fund manager) on each one of its investments. Cash-flows are gross of all fees charged to the fund investors. The Thomson dataset mentioned above (or that of Cambridge Associates mentioned below and in Figure 1) give the cash flows generated by a given fund for Limited Partners (i.e. investors in a private equity fund), net of all fees. The CEPRES dataset, therefore, differs from the

aforementioned two datasets in terms of data aggregation level (fund versus investment) and fees (gross versus net).

CEPRES is a private consulting firm established in 2001 as a co-operation between the University of Frankfurt and Deutsche Bank Group. Data is obtained from private equity firms who make use of the "Private Equity Analyzer" service. Participating firms sign a contract, undertaking to provide the correct cash flows (before fees) generated for each investment they have made in the past. In return, the firm receives statistics such as risk-adjusted performance measures. These statistics are then used by the private equity firm internally for various purposes, such as bonus payments or strengths/weaknesses analysis. CEPRES does not benchmark private equity firms to peer groups. This improves data accuracy and representativeness as it eliminates incentives to manipulate cash flows or cherry-pick past investments. This program has been very successful and, in 2009, it reached a coverage of 1200 private equity funds (including venture capital, buyout, infrastructure and mezzanine) with a geographical split of 50% from North America, 40% from Europe and 10% from Asia.<sup>viii</sup> A subset of this database, covering mainly venture capital investments, is used by Cumming, Schmidt and Walz (2009), Cumming and Walz (2009) and Krohmer, Lauterbach, and Calanog (2009).

The buyout side of this dataset was used by Franzoni, Nowak and Phalippou (2009). Data contain all liquidated buyout investments and their cash flows as of December 2007. Franzoni et al. (2009) computed modified Internal Rates of Returns (IRRs) and the alpha/betas of buyout investments. They found modified IRRs in the range of 20% gross of fees across time periods and continents. According to Phalippou (2009) this means that the modified IRR is about 12% *net of fees*. These numbers are consistent with those mentioned above, in sub-section 1.1.

In addition, Franzoni et al. (2009) find that market beta for buyout investments is close to 1.3 (which is the same number as what Cao and Lerner (2008) find for post-IPO reverse buyout transactions). It is higher than what Driessen et al. (2009) found on their much smaller dataset but, in all cases, the beta of buyout funds/investments seems to be relatively small. This is surprising at first sight because the higher leverage used in buyout investments should increase the (equity) beta. Since it is not the case, there are basically two (non mutually exclusive) possibilities. First, higher leverage may reduce the beta on asset (e.g. the disciplinary role of debt may reduce risk and private equity ownership may increase profitability). Second, private equity firms may target companies with lower beta on asset.

Finally, Franzoni et al. (2009) find that buyout investments are exposed to liquidity and distress risks (the Fama-French HML and SMB factors). Adding up all these risk components, they estimate that the cost of capital for buyout investments is 18% (in excess of risk-free rate).

#### *1.4.2 Fundraising Prospectuses*

The prospectuses that private equity firms provide investors with when raising funds contain cash multiples and IRRs of all their previous investments. We have collected performance information on 12,000 investments from the prospectuses of buyout firms. These data, however, do not give underlying cash flows and are gross of fees. These data are analysed in Lopez-de-Silanes, Phalippou and Gottschalg (2010). One way to think of these data is that they are similar to those of CEPRES but without the detailed cash flows. This point is important because without the detailed cash flows saying anything about

average performance is next to impossible. This is because the average IRR of investments is usually very different from the IRR of all investments pooled together. This is also true at the fund level, but the difference is larger at the investment level.

The value weighted multiple is a more relevant figure, although without a precise duration measure it is of limited statistical value. As a result, these data cannot be used to provide an informed insight to average performance. Yet, these data are useful to explain cross-sectional differences between investments and hence they will be used in section 2 below. The usefulness of IRR and cash multiples in the cross-section stems from the fact that these measures of performance are highly correlated at the investment level to more accurate measures. This was shown with CEPRES data by Franzoni et al. (2009). Plain IRR and modified IRR (a more accurate measure) have a correlation of 97%. The Public Market Equivalent (PME) and the cash multiple have a similar correlation.<sup>ix</sup> The only caveat is that IRR and multiple need to be winsorized (e.g. at the 95<sup>th</sup> percentile), otherwise outliers make any regression analysis meaningless.

### *1.4.3 Investor Records*

Some researchers have had access to the detailed track record of certain investors, observing the cash flows amount and the date for each portfolio company. An example is the proprietary dataset of Ljungqvist and Richardson (2003), which contains 207 private equity funds.

On the one hand, these are ideal data as they leave no room for cherry-picking from GPs, all fees paid would be expected to be reported and all fund track records would be expected to be uninterrupted. Finally, the timing and amount of cash flows would be

expected to be precise. The downside, however, is that investors who are willing to share their data may be above average. It would be surprising if investors who lost significant amounts in an asset class would be happy to provide information on how poorly they have performed. In addition, even if all investors were equally happy to share their track record, there would still be the survival issue to reckon with. If an investor still invests in private equity, then it is likely to be the case that its performance was satisfactory. Having said that, there appears to exist no alternative to this type of data: one needs to have the exact track record of, hopefully, a large number of investors in order to be in a position to know if at least one group thereof had a satisfactory return in private equity.

#### *1.4.4 Preqin*

A source of data that is becoming increasingly important is that of Preqin (previously known as 'Private Equity Intelligence'). Preqin offers two types of data. The *first* is a list of a number of private equity funds and their most recent performance, measured by IRR or cash multiple (i.e. total distributed, divided by total invested). The data mainly come from pension funds in the US, since the said funds are under a legal obligation to provide a full list of all the funds they are investing in and the most up-to-date performance figure for each one of them. The *second* type of data is a cash flow dataset, very much like the one of *Thomson*. The coverage is not as comprehensive as that of *Thomson* for earlier years but, with the passage of time, coverage is improving. At the moment, about one in three mature funds in the first dataset is present in the cash flow dataset; the ratio is higher for buyout funds and lower for venture capital funds.<sup>x</sup>

We provide some descriptive statistics derived with the first dataset, which is the most comprehensive one. We select all funds raised before 2000 and separate venture capital from buyout funds. The performance is as of December 2009. Where size is missing, we replace it by the median size (\$300 million in buyout and \$100 million in venture capital). For the missing multiple and IRR, we use the following formula to infer one from the other:  $\text{Multiple} = (1 + \text{IRR})^{\text{duration}}$  and we assume a duration of 6 years for all funds; this is the effective duration of PE funds estimated by Phalippou and Gottschalg (2009).

We count 492 buyout funds (a fairly substantial sample). The (size-weighted) mean and median IRR for buyout funds is 12%. The (size-weighted) mean and median multiple is 1.7 for buyout funds. These numbers are consistent with an effective duration of 5 years (an investment returning 12% a year for 5 years would have a multiple of about 1.7). Most importantly, these numbers are similar to what has been documented in earlier studies (see section 1.1). So, for mature buyout funds, it seems that we have some consistent answers. One problem, however, with judging performance for buyout is that the growth has been very strong and that performance has been extreme in recent years. Funds raised between 2001 and 2004 seem to have experienced high returns in their early years. Funds raised in 2004-2007 have invested about as much as all the buyout funds before them and what their performance is, is not really known. The financial crisis seems to have significantly hit buyout fund performance but whether that is indeed the case and to what extent will only be known in 5 to 10 years.

For venture capital funds there are even more mature funds. We count as many as 892 of them. Their median IRR is 7.5% and their value-weighted IRR is 10% (despite some IRRs above 500%). Similarly, median multiple is 1.5 and value-weighted multiple is 1.8.

Again, these statistics are consistent with those previously reported (see section 1.1). The advantage of these data is that anyone can subscribe to and verify their accuracy. Simple analysis like the one conducted above shows that returns are indeed low.

#### *1.4.5 Round Data*

In the context of real estate, art (e.g. paintings) and venture capital, the data may consist of market values observed at different points in time, with only negligible cash flows in between. Each time a building or a painting changes hands, we observe a market value. Each time a venture-capital-financed company reaches a so-called “round milestone”, we observe a valuation. We call such data “round data”.

For venture capital, the most comprehensive “round data” source is Sand Hill Econometrics, who combined data from existing databases (VentureOne and Venture Economics), adding information from proprietary data sources. These data give the value of a company at each valuation round until the exit (trade sale, IPO or bankruptcy). By analyzing these data, one can draw conclusions about the risk and return profile of the target company. However, the risk and return faced by the private equity fund investor is bound to be different. For example, in case of an IPO-exited project, the return observed will be based on the IPO offering price and not on the price at which the investors have sold. An extreme example where this distinction has mattered a lot is the eBay IPO. Benchmark Partners’ return in eBay was 20 times the investment at the time of the IPO. However, investors received the eBay stocks 6 months after the IPO, when their price had increased by more than 3000%, making their stake worth 700 times the investment. Hence the return from each financing rounds to the IPO can be very different than the return of the

private equity fund investors. Moreover, it is unclear whether the equity stake of a venture capitalist changes across rounds and how that would impact on estimated returns.<sup>xi</sup> What this means is that results on risk and return drawn from data on round valuation will be different from those drawn from data on cash-flows to/from investors. This is an important caveat to bear in mind in order to understand the literature.

Cochrane (2005) is the first to have computed the alpha and beta of venture capital using these data. He finds a beta around 2 and an implausibly high alpha. At the time, however, the dataset was quite noisy and his assumption of log-normality has since been challenged (Korteweg and Sorensen, 2010). Korteweg and Sorensen (2010) use a cleaner version of the same dataset and avoid strong distributional assumptions. Formally, they combine a Tobit model with a dynamic filtering and smoothing problem. They present a Markov Chain Monte Carlo estimator using Gibbs sampling, which produces the posterior distribution by iteratively simulating from three distributions: a Bayesian regression, a draw of truncated random variables and a path from a Kalman filter. They find a beta around three, which is similar to what is found by Driessen et al. (2009) but the alpha they report appears implausibly high just like that of Cochrane, i.e. over 30% per annum.

What is important to bear in mind is that return figures for these investments are not available for about half of the observations, with returns for the said investments being extrapolated by a statistical model. It would be interesting to see what the alpha would be if all these investments were assumed to have a -100% rate of returns, which would not be unreasonable, as investments that do not benefit from an extra financing round are often worthless (in venture capital). It is also not very well understood why alphas are so high with the econometric approaches of Cochrane (2005) and Korteweg and Sorensen (2009). It

seems that some of it comes from a volatility correction and the estimate of volatility is always very high with these data.

#### *1.4.6 Listed Vehicles*

Publicly traded private equity firms are essentially closed-end funds.<sup>xii</sup> As such, they are publicly traded just like any stock. They got in the spotlight recently as a number of indices based on these stocks were launched in the course of the last decade (e.g. S&P Listed Private Equity Index, PowerShares Listed Private Equity Fund, LPX50).

Most of the private equity money is invested via private partnerships, not via listed vehicles. The research reviewed above focuses solely on private equity partnerships. As Jegadeesh, Kraussl and Pollet (2009) aptly point out, however, some of these listed vehicles are funds-of-funds (FoFs), which themselves invest in private partnerships. As a result, we can observe regular market prices for a pool of partnerships. At first sight this is an extremely attractive feature. In addition, sample selection bias may be low although FoFs are supposed to select the best private equity partnerships.

These FoFs inform their investors annually of the total investment, distribution, net asset value and fees faced by the fund-of-fund. The general perception of NAVs in private equity is that these are not reliable. Hence, the information they provide cannot enable the computation of a reliable return. When conducting a due diligence, large investors would gather a good deal of information about the accounting of portfolio companies to evaluate the NAVs and therefore form an opinion on the market values and actual returns. Investors in listed FoFs do not have access to such detailed information. But even if these investors did have access to all the information possible, could they process it efficiently? Large

investors in private equity tend to invest directly in private partnerships, not via listed vehicles. Investors in listed vehicles are typically small and with little knowledge of the intricacies of such a complex asset class (e.g. Cumming, Fleming and Johan, 2010). So the question is: can investors come up with a reasonable market price? Do variations in such a market price have anything to say about the risk/return profile of the asset class?

There are two main applications for which we need the risk/return of a publicly traded stock. The first is to obtain expected returns and expected covariance so as to build an optimal asset allocation. The second application is to compute the cost of capital to be used by the chief financial officer to assess whether projects have a positive Net Present Value (NPV) or not. For the first application, even if the risk/return profile we compute from market prices is not that of the underlying business, that is not relevant. What investors want to know is the type of risk/return payoff they will face when investing in a given stock. So, back to the private equity case, if an investor wants to invest in these FoFs, what she cares about is the risk/return that these vehicles exhibit. It does not matter to her if the said risk/return coincides with the true underlying risk/return.

Different considerations apply to the second application. The cost of capital should be based on the true risk of the business. If the market does not provide the right answer, that is an issue. For example, let us assume that, for whatever reason, the market dislikes value stocks. As a result, value stocks have a high return. Should the value corporations use this high return in their NPV calculations? Perhaps not, or else they would invest in too few projects. Back to the private equity case, if one wants to know the risk profile of a private partnership, it is crucial that the market provides the right answer. To make the case more concrete, assume that the market under-reacts to news for private equity listed vehicles, possibly because it does not observe most of them. In that case, the stock may follow the

market return more closely than it would otherwise do. Without such an under-reaction, the beta may be very different. Similarly, recent literature (e.g. Barberis and Shleifer, 2003) has pointed out that stocks tend to co-move more with those that are included in the same index than with those that are classified in the same industry. A chemical company that belongs to the S&P 500 may co-move more with Microsoft (as they both belong to the S&P 500) than with a chemical company that is not in the S&P 500. Hence, private equity listed vehicles may co-move more closely with the stock-market than with the underlying business. While some of the above are only assumptions, we believe that bearing them in mind is apposite.

Nonetheless, it is interesting to know what private equity listed vehicles offer in terms of risk and return profile.<sup>xiii</sup> Jegadeesh, Kraussl and Pollet (2009) find an alpha close to zero. In addition, Jegadeesh, Kraussl and Pollet (2009) observe that 12 months after an IPO the discount (market price to NAV) stabilizes at about 10%. Given the fees of these funds, they compute that this discount implies that investors expect that the underlying partnerships return a small positive alpha. This is because most of the discount corresponds to future expected fees. This is an interesting and reassuring finding. Investors expect the asset class to provide a small alpha. Simply put, studies that look at actual cash flows find that reality is different from expectations. Such studies of private equity discount may also bring insights into how sentiments regarding private equity vary over time and also about the biases in NAVs. For instance, Jegadeesh, Kraussl and Pollet (2009) find that listed vehicles returns forecast future changes in the NAV that private equity funds report.<sup>xiv</sup>

## 1.5 Industry Benchmarks and Investor Perceptions

After reviewing the academic literature on risk and return of private equity, the picture that emerges contrasts with that of the general public that the average venture capital or private equity fund perform well. It may then be interesting to turn to the investor side and see why private equity investors think otherwise. An investor who is perceived as the most knowledgeable on this asset class, David Swensen, Yale's CIO, has stated that:

“While the value added by operationally oriented buyout partnerships may, in certain instances, overcome the burden imposed by the typical buyout fund's generous fee structure, in aggregate, buyout investments fail to match public alternatives (...) In the absence of truly superior fund selection skills (or extraordinary luck), investors should stay far, far away from private equity investments.(...) Some part of the failure of buyout managers to produce risk-adjusted returns stems from the inappropriate fee structure.(...) Because the incentive compensation fails to consider the investor's cost of capital, buyout partnerships capture 20% of the returns generated by favorable wind at the long-term equity investor's back.(...) The large majority of buyout funds fail to add sufficient value to overcome a grossly unreasonable fee structure.” (D. Swensen, 2005, pp 133-135).

It follows that, both academics and top investors seem to agree that the average venture capital or private equity fund has poor performance. Why does the general public think otherwise?

Private equity industry associations (e.g. NVCA, EVCA) announce aggregate performance every quarter (see Figure 1). Invariably, these returns are above those of public

equity markets over long horizons (e.g. over the previous 10, 15, 20 years). These reports are the only source of performance information for this asset class. As a result, they are widely disseminated by the press to the investment community. As seen above, two academic studies have used the same underlying data as those used by the industry associations, but different methodologies (Kaplan and Schoar, 2005, and Phalippou and Gottschalg, 2009). Both have reached results that are more sobering than those of industry associations: both buyout and venture capital funds have a performance that is at best similar to that of the S&P 500. These studies used data ending in 2001 and 2003 respectively. More recent performance may be higher, but in those years (2001-2003), the industry associations were also posting strong outperformance of private equity compared to public equity. Hence, differences in methodology probably provide a plausible explanation for the discrepancy in results.

The current industry approach measures performance from one point to the other (called end-to-end returns or point-to-point returns). This method consists in taking the sum of all NAVs (for example) as of December 2005 and treat it as if it were the amount invested at that date. All the net cash flows are then recorded for all the funds from 2006 to 2010, with all NAVs as of December 2010 being summed and treated as a dividend payment at that date. The IRR of the resulting stream of cash flows is what is called the “past 5 years private equity return.” It is possible that these aggregated NAVs may be below the aggregate market value. This is because most of the NAV comes from young funds, which set their NAV to the amount invested. Since returns are positive on average, these NAVs are below market values. So, the aggregate NAV at one point in time may be below market values.

If the aggregate NAV is too low, as suggested above, this has two opposite effects. The effect on initial NAV exaggerates performance (because it lowers the assumed initial investment) and the effect on final NAV under-estimates performance (because it decreases the final value). Which effect prevails will depend on the horizon and the performance level. Longer horizons and higher performance will lower the present value of the final NAV, making the initial NAV relatively more important and, thus, bias returns more upward. Phalippou (2010) shows that this bias can be of sizeable magnitude and can thus, at least partly, explain the difference between the perception of the general public and the results of academic studies.

Another issue with existing benchmarks is that they are very different across data providers.<sup>xv</sup> This sometimes gives the impression that return figures depend mostly on the dataset one uses. But, as we discussed above, the different data available to researchers usually show low performance. As argued by Phalippou (2010) the methodology used for these benchmarks results in very unstable results. Thus, differences in benchmarks may result from the methodology used rather than from any discrepancy in the underlying data. In any case, we can conclude that the common belief that returns have been spectacular has little foundation. If one does not trust the data, then no conclusive outcome is available. To argue that average performance has been high, however, one has to explain why the available data over-represent bad funds and/or misses many dividend payments.

## **2 Fund Selection**

### **2.1 The Importance of a Bottom-up Approach in Private Equity**

Before selecting funds, what an institutional investor typically does first is to decide on the allocation to each broad asset classes, of which private equity is only one (see, for example, van Bisbergen, Brandt and Koijen, 2008).<sup>xvi</sup> For that, it uses some versions of the classical mean-variance framework. The necessary inputs are an expected return for each asset class and correlations between all the asset classes. When it comes to private equity, an estimate of expected return (and, a fortiori, of correlations) is difficult to come up with. Thus, in practice, investors take what is believed to be the long term return of private equity (shown in Figure 1, below) and use it for expected return. Correlations are even more of a mystery, with investors often using some relatively low ones.<sup>xvii</sup> What usually comes out of these algorithms is that all other asset classes (bond, equity etc.) should be shorted in order for a large long position to be taken in private equity. Often, instead of questioning the assumptions (on expected returns and correlations), investors impose some constraints on short sales, as a result of which private equity is brought to a supposedly more reasonable range of 20%-30% of the asset allocation. The objective is then clear: if one has 10 billion under management, 2 to 3 billion should find its way into private equity. This approach is sometimes called ‘top-down’.

**Figure 1: Latest performance report**

US Venture Capital Index Returns for the Periods ending  
9/30/2009, 6/30/2009 and 9/30/2008

For the period ending	Qtr.	1 Year	3 Years	5 Years	10 Years	15 Years	20 Years
September 30, 2009	2.3	-12.4	1.3	4.9	8.4	36.6	23.1
June 30, 2009	0.2	-17.1	1.3	5.7	14.3	36.3	22.7
September 30, 2008	-2.9	-0.9	10.2	10.7	40.2	33.3	22.2
<b>Other indices at September 30, 2009</b>							
DJIA	15.8	-7.4	-3.3	1.8	1.6	8.7	9.2
NASDAQ Composite	15.7	1.5	-2.0	2.3	-2.5	7.0	7.8
S&P 500	15.6	-6.9	-5.4	1.0	-0.2	7.6	8.0

Source: Cambridge Associates LLC

The above approach can lead to problems that are more acute in private equity than they are in other asset classes.<sup>xviii</sup> The reason is that private equity performance is very cyclical, with low performance and small inflows following periods of particularly high performance and large inflows. In a nutshell, at some point in time, some private equity investments return very large amounts. Next, investors rush large amounts of capital to private equity. This may be because investors put in their mean-variance tool higher return expectations and, so, get as an answer that allocation should be increased. At that point, one typically witnesses much higher valuations because private equity firms compete more forcefully for a limited pool of deals (Gompers and Lerner, 2000). Since these higher valuations are the result of price pressure rather than better prospects, the ensuing returns are low. As a consequence, investors following the top-down approach end up in the worse possible situation: they increase allocation to private equity most when expected returns are at the lowest. This unfortunate outcome could be corrected by having a better estimate of expected returns. Instead of using the supposedly long-run performance of Figure 1, one could have a forecast model for expected return based on past performance, aggregate allocation to private equity etc. (for an example, albeit simple, of such a model see Kaplan and Stromberg, 2009).

The fact that not all investors are equal poses yet another problem. If investor 'Lambda' from Toulouse-France decides to invest \$100 million in US public equity, she can expect a similar return as D. Swensen from New-Haven, Connecticut, USA. But if investor 'Lambda' invests \$100 million in private equity, she will probably not secure the same return as D. Swensen. The main reasons are that they will face different fees, they will not have access to the same funds and they may not receive the same amount and quality of co-investment opportunities.<sup>xix</sup>

As a result, a bottom-up approach is more promising in private equity than a top-down approach. Each year, one needs to evaluate the opportunities, try to identify which ones are positive NPVs for him/her and invest in as many positive NPV propositions as possible, probably with an upper bound of around 10%-20% of the total portfolio. As positive NPVs are difficult to identify, that may not always be easy to achieve. Yet, this is the best route. A fund should probably be discarded whenever a business proposal seems unlikely to bring value (e.g. crowded strategy, no expertise in the strategy etc.), when true past performance (as opposed to the potentially window-dressed figure featuring on the prospectus) is poor and there is no reason to believe the future will be any different, when the contract does not align interests and has a high level of performance insensitive fees etc.

In some years, only a handful of funds will pass this test and the allocation to private equity will be relatively low; in other years, more funds will pass the test and the allocation will be relatively high. What is most important with that approach is that investors do not tie their hands upfront. It is the existing opportunities that dictate allocation, not the other way around.

## **2.2 Top Quartile**

A common argument from private equity investing advisors is that the average private equity fund should be avoided as only top quartile funds deliver good returns (e.g. Fraser-Simpson, 2007). Note that this argument is consistent with the academic results reviewed above, but not with press-coverage, nor with the beliefs of most investors.

Next, advisors typically argue that investing in top quartile funds is not difficult if one is familiar with the asset class (e.g. Fraser-Simpson, 2007). While the above may be

true, one still has to explain why 75% of the money in private equity (invested in the bottom three quartiles) would be so-called ‘dumb-money’.<sup>xx</sup> In addition, there is an important caveat to bear in mind: a disproportionately high number of top quartiles funds are from a few vintage years. This is because of the high cyclical nature of private equity performance noted above, which is why investing in top quartile funds is as much about finding the top funds in any given batch as it is about market timing. Below, we will discuss why the later may be more difficult than the former.

**Table 2: Fund selection**

This table shows the effect of selecting a sub-set of funds. It uses Prequin data on fund performance as of December 2009. It considers funds raised from 1985 to 2000, either venture capital (Panel A) or buyout (Panel B). For each selection criterion, it reports the number of funds selected the IRR of the 5<sup>th</sup> percentile (value at risk) and of the 50<sup>th</sup> percentile (median). Top vintage years are those with the highest median IRR.

Panel A: Venture Capital funds

	N_obs	Value at risk (5 <sup>th</sup> percentile)	Median
Top quartile funds	207	21%	39%
Every vintage year, select only funds in			
In top quartile	209	6%	31%
In top half	421	-1%	19%
Not in bottom quartile	621	-7%	12%
Not in top quartile	619	-22%	1%
Select all the funds, but select only			
In top 5 vintage years	163	-11%	19%
Not in top 5 vintage years	665	-21%	4%
Mix of the two:			
Avoid bottom quartile in top 5 years	123	7%	26%
Top quartile, avoid bottom 5 years	104	21%	54%
Top half, avoid bottom 5 years	211	14%	32%

Panel B: Buyout

	N_obs	Value at risk (5 <sup>th</sup> percentile)	Median
Top quartile funds	120	23%	31%
Every vintage year, select only funds in			
In top quartile	123	15%	28%
In top half	244	9%	22%
Not in bottom quartile	362	2%	17%
Not in top quartile	357	-15%	9%
Select all the funds, but select only			
In top 5 vintage years	62	-9%	22%
Not in top 5 vintage years	418	-11%	11%
Mix of the two:			
Avoid bottom quartile in top 5 years	47	12%	29%
Top quartile, avoid bottom 5 years	62	22%	33%
Top half, avoid bottom 5 years	123	17%	26%

Table 2 shows the effect of selecting a sub-set of funds. It uses Prequin data on fund performance as of December 2009. It considers funds raised from 1985 to 2000, either venture capital (Panel A) or buyout (Panel B). For each selection criterion, it reports the number of funds selected, the IRR of the 5<sup>th</sup> percentile (value-at-risk) and the IRR of the 50<sup>th</sup> percentile (median). Top vintage years are those with the highest median IRR. If one selects the top quartile of all venture capital funds, the median IRR is 39%. If one selects the top quartile of venture capital funds every single year among those offered that year, the median performance is lower at 31%. However, the value-at-risk is very different. Overall top quartile funds have a value-at-risk of 21% while the every-vintage top quartile funds have a value-at-risk of 6%.

Similar results, although less dramatic, apply to buyout funds, suggesting that timing the market is important to avoid poor performers. Results also show that if one never invested in a top quartile fund, the median IRR is a meagre 1% in venture capital and 9% in buyout. Another interesting result is that if an investor missed only the top five best vintage years, representing less than one fund in five, the returns are very low. In venture capital the median IRR is 4% and value-at-risk is -21%. Similarly, for buyout funds, the median IRR is 11% and the value-at-risk is -11%.

Avoiding the worse years also matters. If an investor simply picks the top half of the funds each year but avoids the five worse years in venture capital (1986, 1996, 1998, 1999, 2000), the returns are high (especially the value-at-risk). The same holds true in buyout, with the worse five years being from 1995 to 1999. These results show that if one can always select the top quartile funds in any vintage year, median performance will be high but value-at-risk will be lower than that computed on the full sample. Also, most high-return funds and low-return funds come from the same vintage years. Finally, the importance of cycles seems higher for venture capital. But when we will have the final performance of the post-2000 buyout funds, we may find a cyclicity that is equally strong in buyout as it is in venture capital.

What the results above show is that statistics on top quartile funds derived from aggregate (cross-vintage) data may differ from what investors experience if they do not time the market well. But market timing is trickier than fund picking. If one does not invest in, say, KKR 2005 because it is a bad year to invest, KKR may not allow one to invest in KKR 2010, as private equity firms will occasionally write investors off once they skip one fund generation (they will insist on having a stable and reliable pool of capital). Another

difficulty is that allocations to private equity will vary a lot over time, something that some institutions may not like.

### **2.3 Contract Issues**

An important dimension to analyse when deciding to invest in private equity is the contract. As Phalippou (2009) points out, private equity contracts contain perilous provisions. Many private equity funds can (almost) freely charge fees to portfolio companies. Obviously, investors indirectly pay for most of these fees. The equilibrating mechanism consists in private equity firms refraining from charging too much because, if they do, investors may not invest in them in the future. But when a private equity firm performs poorly, it may not be able to raise another fund. The equilibrating mechanism thus fails in that case and a private equity firm in this situation may be tempted to charge high fees so as to divert as much cash as possible to its own benefit and at the expense of the investor. This is a so-called ‘hold-up’ problem.<sup>xxi</sup>

A related issue arises from fund co-investments. Private equity funds can co-invest with selected investors in certain portfolio companies. This raises a number of questions. For participating investors, they need to see whether co-investments do not increase their risk exposures because fund managers may want to control the risk they take and, thus, share the riskiest deals with someone else. Another issue is whether non-participating investors are being squeezed out of the best deals and whether this is cycle-dependent. It may happen more often in bad times because private equity firms may want to privilege their largest investors most in those times. In that case, risk increases for the non-participating investors.

Finally, the lack of restrictions on the location or industries of portfolio companies can raise important challenges for investors. The challenge is that investors do not know what their country and industry exposures will be. They may channel half of their capital to a buyout fund based in Germany and another half thereof to a buyout fund based in Australia and can end up with a portfolio that is by 50% invested in the retail industry in India. This is, of course, an exaggeration, which nevertheless illustrates the type of challenge that investors face. Not only is such a portfolio undiversified but, also, it carries an important currency risk.<sup>xxii</sup>

## **2.4 Predictors of private equity funds performance**

We have mentioned market timing above as a tool to outperform in private equity. We now turn to fund picking (i.e., choosing among competing funds). We begin by what is the most recurring argument: there is performance persistence in private equity, so find the top firms and invest with them. Academics have been investigating issues of relevance to the performance persistence of mutual funds for some 20 years. There is a quasi-consensus: there is no persistence. In a striking example, Malkiel (1995) lists the 20 best funds in the 1970s and their ranking in the 1980s. Only two funds stayed in the top 20, with the remaining funds having had fairly low rankings.<sup>xxiii</sup>

In Table 3, below, we repeat a similar analysis with Preqin data. We take the Venture Capital funds raised between 1980 and 1989 that are in the top 10%. They belong to 17 different firms. Three firms have several funds in the top 10% and we keep only the fund from the earliest vintage year. The IRRs are all above 30%. Next, we record the ranking of the next two funds raised in the 1990s, along with their vintages and returns.

**Table 3: Performance persistence**

Top decile Venture Capital funds. Ranking is based on IRR. Funds are raised between 1980 and 1989. If a firm has several funds in the top decile, the earliest fund is kept. The rank achieved by the next two funds raised in the 1990s is shown along with the vintage of these funds and the IRR.

Firm rank	Vintage	IRR	(next 2) Ranks 1990-1999	Vintage	IRR
1	1989	198.5	10, 363	95, 99	192, -8
2	1981	67.4	35, 121	92, 95	87, 11
3	1982	64.3	5	91	346
4	1983	51.6	76	91	48
5	1980	50.6	21, 88	92, 94	39, 125
6	1989	46.1	n.f.		
7	1988	43.4	334, 337	90, 93	-4, -10
8	1988	43.1	213, 96	91, 94	10, 34
9	1988	42.1	81, 16	93, 97	40, 135
10	1989	39.6	26, 13	92, 96	110, 167
11	1988	35.8	113, 14	94, 97	30, 160
12	1983	35.4	n.f.		
13	1989	35.1	n.f.		
14	1989	33.6	34, 24	93, 97	87, 120
15	1989	33.5	87	91	40
16	1988	31.8	311	92	-1
17	1988	30.1	207	92	11

Results do not seem very different than with mutual funds. The average ranking for the next two funds is 114. Only one firm stayed in the top decile with all its funds. If one looks at the top venture capital firm from the 1980s, it raised a top fund in 1989, then the next fund was raised in 1995 and that fund too had a very high return, but then the third fund, from 1999, had a very poor performance. The problem is that investors in 1995 may not have known that the 1989 fund would do so well. The 1989 fund liquidated around 1999. But knowing in 1999 that this firm has high returns was not very useful because the 1999 fund did very poorly. In a sense, 1999 was too late to know that this firm was good (one should have known in 1995, when the second fund was raised).

What academics have originally called persistence is to do with the fact that two successive funds have positively correlated returns. For example, if KKR III (i.e. the 3<sup>rd</sup> fund raised by KKR) had high returns then KKR IV (i.e. the next fund raised by KKR) also had high returns. Similarly, if ABC IV had low returns, then ABC V also had low returns. Kaplan and Schoar (2005) also find that for venture capital funds (but not for buyout funds) the result holds true if one were to skip one fund. To continue with the above example, this means that if ABC IV had low returns then ABC VI also had low returns and if ABC IV had high returns then ABC VI also had high returns.

Phalippou (2010) investigated in detail this issue of time between two funds and found that the more time one requires between two funds of the same firm, the lower performance persistence is. Once one requires more than 5 years in between two funds, the persistence results disappear. Hence, while one may skip one fund in the analysis, what this means in practice is that, on average, 3 to 4 years are required between the focal fund and the previous fund. If one goes beyond this threshold, there is no longer any performance persistence. What this entails is that while some firms repeat successes, it may be difficult for investors to design an effective selection strategy based on that result. In practice, by the time they can see that a firm has generated good past performance, it may be too late, as the next fund may not perform well.

Yet, there may be ways to exploit early performance indicators to select funds. Hochberg et al. (2009), for example, find that if one takes the maximum IRR over all the funds previously raised by a firm at time  $t$ , this would help predict the performance of the fund raised at time  $t$ . So, when firm ABC raises fund IV, the investor will look at the current performance of funds ABC I, ABC II and ABC III, and take the highest IRRs among these three funds. If that number is high ABC IV will have high returns (and vice

versa). In that case, there would be a predictability that is exploitable by investors. What this shows is that analyzing the track record probably helps selecting the right funds. However, this should not be done in a naïve way.

Looking at fund size or, more specifically, at the number of portfolio companies, may also be helpful. Lopez-de-Silanes, Phalippou and Gottschalg (2010) show that the main driver of performance in buyouts is the number of investments held in parallel by a firm. The more investments a firm manages, the poorer the performance. This coincides with a widely held belief in the investor community that diseconomies of scale are important in private equity. Thus, prospective investors may pay special attention to firm scale and changes in firm scale. Related to this finding, Cumming and Dai (2010) find that, in venture capital, fund size *increases* whilst geographic proximity *decreases* valuations. All else being equal, what this would mean is that in venture capital better returns are obtained when the venture capitalist is physically close to its portfolio companies and runs smaller funds. Gompers, Kovner and Lerner (2009) have also found that specialized venture capital firms perform better.

### **3 Conclusion**

We have reviewed the literature on risk and return of private equity (venture capital and buyout) and compared the different datasets used in academic research. Returns do not seem as spectacular as often conjectured. Irrespective of the datasets, the average return seems to be lower than public equity returns. Buyouts seem to bear a moderate market risk (beta is around unity), but they have a significant exposure to liquidity and distress risk. The cost of capital of buyout is 18% (in excess of risk-free rate). The beta of venture capital

seems much higher (around 3), implying a cost of capital of about 20% (in excess of risk-free rate and any potential liquidity risk premium). The finding of low average returns is consistent across datasets and coincides with the finding of leading private equity investors. It is, however, in contrast to what industry associations advertise and what the broad public then believes. We conjecture that the methodology used by industry associations may be behind this apparent contradiction. Finally, we have addressed the issue of fund selection, emphasizing the importance of a bottom-up approach when investing in private equity, showing that top-quartile returns and evidence of performance persistence should be approached with some caveats in mind and describing variables that have predicted returns.

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## Endnotes

<sup>i</sup> In this chapter, private equity comprises buyout investments (typically mature companies purchased with a substantial amount of debt) and venture capital investments (typically companies in early stage of their life, often with negative earnings and no possibility to borrow money).

<sup>ii</sup> Note that Driessen et al. (2009) constructed a model that converts NAVs into market values using a statistical model. The model predicts that the market value of these NAVs is less than 10% of reported NAVs.

<sup>iii</sup> They use a separate and widely available 'investment dataset' known as VentureXpert. Data include information about 29,739 companies (location, industry description, age), their investment characteristics (time of investment, stage, equity invested, exit date and mode), and funds that invested in them (fund size, investment focus, vintage year, headquarter). The unique feature of their dataset is that they have a link between the 'investment' dataset and the 'cash-flow' dataset. In the 'investment' dataset, they can observe the characteristics of funds that are not included in the 'cash-flow' dataset. They find that funds that are *not* part of Thomson cash flow dataset are indeed inferior in the sense that they have fewer investments exited successfully (i.e. via an IPO or an M&A).

<sup>iv</sup> The analysis in this section was repeated with venture capital funds instead of buyout funds and results were similar.

<sup>v</sup> NAVs are values that funds themselves attribute to on-going investments using internal models.

<sup>vi</sup> For example, an investment returning only 4% per annum for ten years would have a cash multiple higher than 1.45.

<sup>vii</sup> The average effective duration of a fund may be smaller. Effective duration would take into account the fact that the fund is not fully invested at any point in time, nor does it liquidate everything at the end. Phalippou and Gottschalg (2009) estimate effective duration to be 6.25 years. An investment earning 10% per year for 6.25 years has a multiple of 1.8.

<sup>viii</sup> In addition, CEPRES may be hired as an advisor. CEPRES then receives data on the past performance of private equity firms. If the contractual agreement between the firm and the investor allows it, CEPRES can add that firm's (investment level) track record to their database. If the firm participates in the Private Equity Analyzer program already, then CEPRES systematically cross-checks the data to verify that the above-mentioned contractual agreement is respected. A violation of this agreement has been spotted only once. The firm then corrected the entries shortly afterwards.

<sup>ix</sup> As mentioned above, the problem with a cash multiple is that it does not take into account the time value of money. A multiple of 1.3 is high for an investment held for one year but low for an investment held for ten years. A Public Market Equivalent (PME) is like a cash multiple but does take into account the time value of money. PME is the present value of all dividend paid (and final residual value, if anything) divided by the present value of the investments made.

<sup>x</sup> A quick check of the data indicates that the funds present in the cash flow dataset seem to have better performance than the average fund in the comprehensive dataset.

<sup>xi</sup> Another difference between round returns and those experienced by investor comes from fees. Fees vary across funds, over time, and are non-linear in performance. They thus affect estimates of both risk and abnormal return. In addition, the stake of fund managers in a company changes over the project's life. If the stake of a fund manager is higher when the expected return is higher than the investor's performance will be superior to that of the project. The project and investor risk/return may be close to one another but there has not been any evidence on this yet and it is not obvious they will be.

<sup>xii</sup> In the UK, these vehicles are commonplace in private equity, mainly due to some special tax alleviation provisions.

<sup>xiii</sup> Studies of listed private equity vehicles include Jegadeesh, Kraussl and Pollet (2009), Bergmann, Christophers, Huss and Zimmermann (2009), and Kaserer, Lahr, Liebhart and Mettler (2010).

<sup>xiv</sup> Note, however, that this does not mean that investors in listed PE can outguess the NAVs. It can be that NAVs are marked-to-market with some delays and that listed PE simply follows the movement of the stock-market. In this case the discount will forecast future changes in NAV, yet investors in listed PE have not outguessed anyone.

<sup>xv</sup> Cornelius (2010) provides an extensive coverage of this issue.

<sup>xvi</sup> "The investment management divisions of banks, mutual funds, and pension funds are predominantly structured around asset classes such as equities, fixed income, and alternative investments. (...) This induces the centralized decision maker of the firm, the Chief Investment Officer (CIO), for example, to pick asset managers who are specialized in a single asset class and to delegate portfolio decisions to these specialists. As a consequence, asset allocation decisions are made in at least two stages. In the first stage, the CIO allocates capital to the different asset classes, each managed by a different asset manager. In the second stage, each manager decides how to allocate the funds made available to him, that is, to the assets within his class" (van Bisbergen et al. (2008, pages 1849-1850)).

<sup>xvii</sup> E.g., the Harvard Management case study from Harvard Business School shows such low correlations.

<sup>xviii</sup> See van Bisbergen et al., 2008, for a study of general problems with the top-down approach.

<sup>xix</sup> Large pension funds are often invited to co-invest with a fund in which they are invested. For Endowments, it is rare. Private equity firms may want to privilege their largest investors and thus cherry pick the best investments. They then invite them to increase their stake in those investments. In addition, they do not charge any fees on those co-investments.

<sup>xx</sup> The expression Dumb money was coined by Frazzini and Lamont (2008) and refers to investors who systematically allocate their money to the wrong stocks. This expression is also used on Wall street by technical analysts and in the press.

<sup>xxi</sup> Note that we have not seen such a behavior yet but hardly any private equity firms have failed in the past.

<sup>xxii</sup> Currency risk can partly be hedged using derivative instruments (e.g. futures contracts) but never perfectly.

<sup>xxiii</sup> For example, the fund that was first in the 1970s was 151 in the 1980s (out of 260).