

PRIVATE EQUITY

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Enhancing private equity returns via diversification

Everybody knows that diversification decreases risk. But what if diversification could also enhance returns? For private equity investors, this question may not just be very relevant but actually have a positive answer. *Christophe Rouvinez and Thomas Kubr* suggest that diversification of private equity investments can indeed be a great way to achieve the returns the asset class promises.

Investments in private equity have never been for the faint hearted. Although large gains can be achieved, losses are common and severe. In this article the return characteristics of investments into single private equity funds are assessed and the effect of diversification on these returns is shown. The significance of these findings is considerable:

- Investments in single funds are highly risky. The probability of achieving outsized returns is surprisingly low and the most likely outcome is less than twice your money back.
- Diversification leads to higher median returns and significantly increases the most likely investment returns.
- Diversification substantially reduces the probability of low performance (bottom quartile or worse) while only slightly reducing top quartile returns.
- Sufficient diversification is achieved with 20 - 30 funds.

Individual private equity investments are risky

There are many ways to measure private equity fund performance. The most common are internal rates of return (IRR) and return multiples. The following analysis focuses on the return multiple, defined as the sum of distributions and net asset value relative to the total capital contribution to a fund. The analyses and results can also be generated using

IRR, but this is at the expense of transparency due to the more intensive computations involving individual cash flows. The analysis is based on return multiples to keep the message simple and the computations easily verifiable. Furthermore, the return multiple of a portfolio of fund investments reduces to the weighted average of the underlying return multiples, which simplifies the computations at the portfolio level.

The reference universe considered for this illustration consists of the 118 US venture capital and buyout partnerships in the Venture Economics database* that were formed from 1990 to 1992 (vintages 1990, 1991 and 1992). The corresponding return multiples as per September 30, 2002 are used as indicators of long-term performance. The 10- to 12- year period has been chosen to be representative of the long-term nature of the asset class. A set of three consecutive vintages has been selected to provide a significant statistical sample. It also serves as a reasonable proxy for a fund of funds.

Managers' skills seem to be responsible for a significant component of the return

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* VentureXpert, Ranked Statistics Report, Total Value to Paid-In ratio since Inception as per 09/30/2002

Large gains from good funds more than compensate for the loss incurred with bad funds

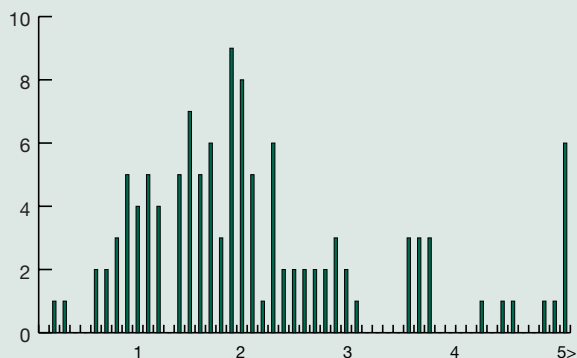
Figure 1 represents the histogram of multiples for this universe. It is striking that 18 out of 118 partnerships show negative performance (in other words, have a multiple smaller than 1.0x) even over such a long horizon, confirming the high-risk nature of individual investments in the asset class.

At the other extreme, six funds are showing multiples higher than 5.0x (last histogram bin), indicating a very large, fat tail on the positive side. The vast

majority of the funds are reporting multiples between 1.0x and 3.0x. The average equals 2.28x and reflects the performance of the overall private equity market over the selected period.

The large dispersion of performance is symptomatic of alternative asset classes, where managers' skills seem to be responsible for a significant component of the return. Such dispersion is also indicative of a high level of idiosyncratic or non-systematic risk, meaning that a large component of the risk can be diversified away by investing with several managers.

Figure 1: Histogram of multiples for all 118 Venture Economics private equity partnerships formed between 1990-1992 as per September 30, 2002.*



* Average equals 2.28x, median equals 1.86x and mode is about 1.85x.

Source: Venture Economics, Capital Dynamics

Private equity's large idiosyncratic risk can be diversified

Modern portfolio theory provides a rigorous mathematical framework around the simple concept that it is safer "not to put all your eggs in one basket." Unfortunately the vast majority of the tools pioneered since Markowitz** breakthrough in 1952 are not applicable to private equity (at least in their current conceptual version), as they rely on the assumption that risk can be described by some form of standard deviation of returns. Since this assumption generally does not hold for alternative assets, we have to go back to naive diversification concepts.

Table 1: Average and standard deviation of return multiples for diversified investments in 1, 3, 10 and 30 funds.

	1 Fund	3 Funds	10 Funds	30 Funds
Average multiple	2.28x	2.28x	2.28x	2.28x
Std Deviation	1.82x	1.05x	0.58x	0.34x

Source: Venture Economics, Capital Dynamics

Table 1 shows the average and standard deviation of multiple for portfolios investing equal amounts in a given number of underlying funds. We obtained these results by running Monte Carlo simulations where the underlying funds are selected at random from the original universe of 118 funds. All funds are assumed to draw the same amount of money over time, so that the multiple of the portfolio corresponds to the average multiple of the underlying funds. As the underlying funds are drawn from a pool with an average 2.28x multiple, one can verify that the average multiple for diversified investments is also 2.28x by construction. Diversification does not impact the average but the standard deviation, which sharply decreases as a function of the number of underlying funds. This decrease corresponds to a considerable reduction of idiosyncratic risk, which turns out to be already statistically significant with 10 funds.

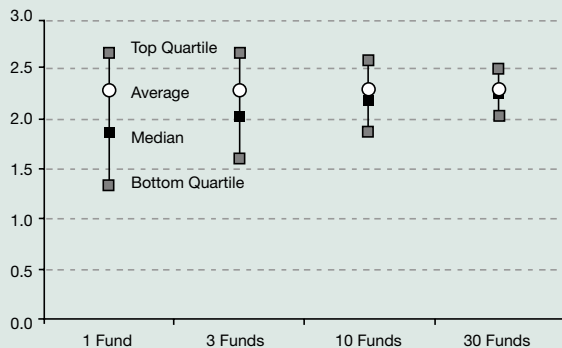
The most likely outcome is not the average

Diversification increases the chances to achieve average performance: it reduces the chances to get very low or very high performance, condensing the probabilities around the average. The reason diversification is so attractive for private equity fund investing is that average performance is not synonymous with median individual fund performance.

** Markowitz, Harry M. (1952). Portfolio Selection, Journal of Finance, 7 (1), 77-91

Figure 2 represents the quartiles of the return multiple probability distribution function for diversified investments in private equity funds. Diversification typically narrows the distribution around the average and reduces the interval between the quartiles.

Figure 2: Top, average, median and bottom quartile multiples for diversified investments in 1, 3, 10 and 30 funds*



*: Top quartile = top grey square, average = white circle, median = black square and bottom quartile = lower grey square.

Source: Venture Economics, Capital Dynamics

A first key observation is that the median of the single fund distribution lies below the average. Thus, when making individual investments, there is more than a 50 per cent chance that the selected fund would perform below average. In fact, for the vintages selected for this analysis, the odds were actually 67 per cent to get a multiple lower than 2.28x and only 33 per cent to get performance above 2.28x. However, when investing in a diversified portfolio of

funds, the results are dramatically different. The chance for out performance improves due to the considerable impact of positive outliers with very high returns on the average. Here we find a key characteristic of private equity fund performance: large gains from good funds more than compensate for the loss incurred with bad funds.

Secondly, the median increases and tends to the average when increasing the number of underlying funds. The odds of achieving average performance are almost back to 50 per cent when investing in about 30 funds.

Finally, the marginal benefit of investing in more than 30 funds is relatively small as the median is already very close to the mean. A further increase in the number of funds beyond 30 would only narrow the uncertainty around the average without impacting the median. Selecting the entire market to get to the average is actually a poor strategy as it forces one to invest in funds that would not have been selected other than to make the count and this consequently increases the overall costs, such as due diligence, legal, monitoring and so on.

Funds of funds require proper benchmarking

As a further direct consequence of the quartile analysis presented in Figure 2, fund of funds should not be benchmarked against the quartiles of individual funds. Comparing the quartiles for a single fund investment with an investment in a portfolio of 30 funds on Figure 2, one immediately notices that bottom quartile fund of funds perform better than median single funds. Thus, comparison with the quartiles of individual funds only makes sense to demonstrate the superiority of a diversified strategy in reducing downside risk, but delivers very little information on the performance of the fund of funds manager.

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Table 2: Multiples for diversified investments and single funds*

Vintages		84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
Top Quartile	Diversified	2.17x	2.30x	2.14x	2.09x	2.09x	2.24x	2.39x	2.61x
	Single fund	2.38x	2.40x	2.38x	2.40x	2.39x	2.60x	2.75x	2.53x
Median	Diversified	1.90x	2.02x	1.94x	1.91x	1.92x	2.02x	2.16x	2.28x
	Single fund	1.55x	1.80x	1.68x	1.69x	1.69x	1.68x	1.86x	1.91x
Bottom Quartile	Diversified	1.72x	1.84x	1.76x	1.74x	1.75x	1.83x	1.95x	2.03x
	Single fund	1.18x	1.29x	1.16x	1.12x	1.15x	1.09x	1.11x	1.41x

* Diversified means 20 funds selected at random from two consecutive vintage years between 1984 and 1992.

Source: Venture Economics, Capital Dynamics

The diversification mechanism reduces both the positive and negative tails

Proper fund of funds benchmarking requires comparison with fund of funds performance. Where no fund of funds data are available, one could rely on synthetic fund of funds returns generated through Monte Carlo simulation, where the underlying funds are drawn at random while respecting the composition of the original fund. As an example, Table 2 provides a comparison between the quartiles of single fund

investments and diversified investments over two consecutive vintages. This procedure is non-trivial but provides information about the ability of the fund of funds manager to assemble good funds together.

The mean, the median... and the mode

A third statistical measure often used as an attempt to characterise a probability distribution with a single number is the mode. The mode is defined as the most probable event. It is especially relevant for this analysis, as it represents the most likely performance with a single trial. Here the mode is

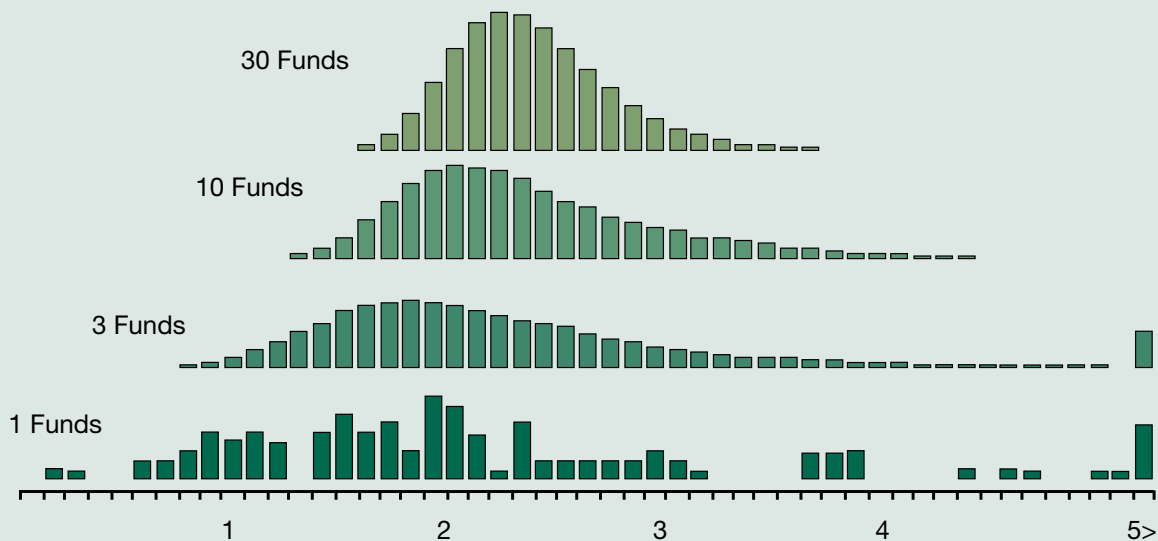
approximated by the value corresponding to the maximum on the histograms on Figure 3. Whereas the histogram for a single fund peaks around 1.85x with a probability of 8 per cent, the histogram corresponding to 30 funds has a maximum around 2.15x with a probability of 12 per cent, indicating a greater chance to achieve better performance with a single fund of funds investment. As Figure 3 illustrates, the diversification mechanism reduces both the positive and negative tails, and also shifts the bulk of the distribution to the right for the benefit of the investor.

Conclusions

The high-risk nature of private equity fund investing actually lies in a large non-systematic risk component that can be reduced when running a diversified programme or when investing in fund of funds. Statistical measures clearly demonstrate the superiority of a diversified private equity fund investment strategy. Beyond the mathematics, private equity naïve diversification works because the high gains associated with a few funds more than compensate for the reduced gains and losses of the others. By diversifying investments in multiple funds, one can simply reduce non-systematic risk and simultaneously increase the chance to capture some of the high-performers.

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Figure 3: Histograms of simulated multiples for diversified investments in 1, 3, 10 and 30 funds.



Source: Venture Economics, Capital Dynamics