

PRIVATE EQUITY

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Asset Class

How volatile is private equity?

Volatility of returns is used by many as a simplified measure of risk when evaluating most asset classes. Unfortunately its utility in the world of private equity is limited on account of the subjective nature of general partner reporting. As an alternative, *Christophe Rouvinez* proposes a cashflow-based methodology for the analysis of long-term private equity volatility. This approach can provide compelling evidence of the importance of private equity portfolio diversification in terms of volatility reduction.

Time-weighted returns are problematic

The simplest way of computing the volatility of a private equity partnership is to measure the standard deviation of time-weighted returns based on figures reported by the General Partner (“GP”). This method, however, yields low volatility figures, and therefore typically misrepresents the risk of the investment. The low volatility results are actually due, amongst other factors, to the nature of the reported net asset value (“NAV”) of the fund which is influenced by the presence of investments held at cost in the portfolio until some realisation event. Another factor is the low frequency of valuation. The NAV used typically corresponds to an accounting regime, with figures being calculated quarterly based on guidelines, as opposed to a daily market price drawn from a stock exchange. Given the differences in how these two asset-pricing models determine value, their respective fluctuations have little in common and therefore cannot be legitimately compared.

Public market proxies are not suitable

Many indexes based on public equity are used by some for the benchmarking of private equity performance. Warburg Pincus/Venture Economics’ Post Venture Capital Index describes the returns of post-venture capital stocks quoted on the public market. Other indexes are based on a selection of

small public stocks, which are believed to reflect the general characteristics of private equity. The Merrill Lynch Quantitative Analysis Private Equity Proxy for example is based on a sub-section of stocks from the Wilshire 5000 universe, which have high volatility and a low beta to the market and low trading volume. In addition, the Merrill Lynch Small Cap Research Private Equity/Micro Cap Proxy is computed from micro cap stocks, which are risky, illiquid, less recognised, and less transparent than blue chips.

As the values of these indexes rely on stock exchange prices, it might seem appealing to use them for benchmarking private equity volatility. However, it is important to keep in mind that private and public equities correspond to different investment models, and that private equity performance characteristics should be assessed based on appropriate private equity data.

Terminal wealth dispersion and volatility

The only information available that can be used to establish an objective private equity asset return is represented by the cash inflows and outflows from individual partnerships. In order to avoid using the NAV, one has to focus on evidence of volatility over a long time period, until the underlying partnerships are liquidated, or the NAV becomes negligible. The variability of outcomes after a long investment cycle can be described as terminal wealth dispersion, which relates directly to expected return and volatility levels by assuming that the observed outcomes correspond to different realisations of a given random process.

As an example, consider the terminal wealth W_T resulting from investing the initial amount W_0 for a period T in a given asset class. Assuming that the price follows a random walk with expected return μ and volatility σ , the dispersion of terminal wealth is well characterised by its average and variance *

$$E[W_T] = W_0 \text{Exp}(\mu T)$$

$$\text{VAR}[W_T] = E[(W_T - E[W_T])^2] = W_0^2 \text{Exp}(2 \mu T) [\text{Exp}(\sigma^2 T) - 1]$$

Provided that the relative change in wealth W_T/W_0 can be observed for a series of outcomes, the above equations can easily be inverted to infer the expected return μ and the volatility σ of the random process that would show the same long-term dispersion

$$\mu = \text{Ln}(E[W_T/W_0]) / T$$

$$\sigma = \{ \text{Ln}(1 + \text{VAR}[W_T/W_0] / E[W_T/W_0]^2) / T \}^{1/2} .$$

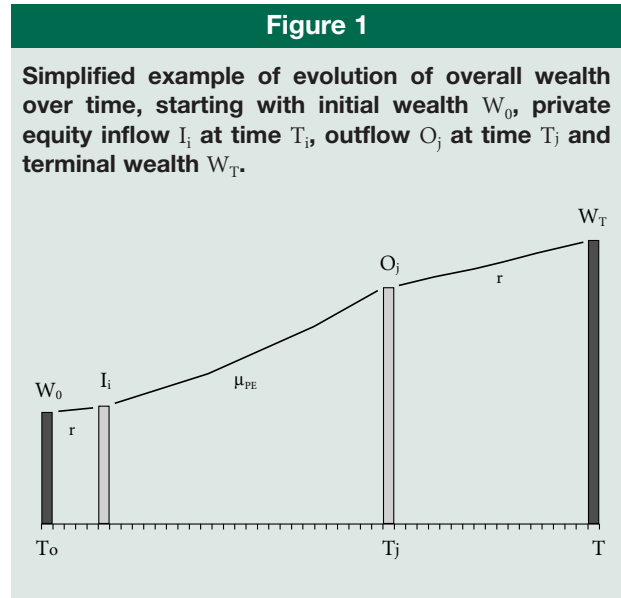
Note that this methodology implicitly relies on the assumption that averages over time and averages over populations are equivalent. This is why it is recommended and apply these quantities over long-term investment periods for which this hypothesis sounds reasonable.

Terminal wealth dispersion and private equity

As originally shown by Austin Long **, the above equations cannot be used blindly for private equity partnerships though. This is because exposure to the asset class is limited to an irregular fraction of the total observation period T . To account for this shorter exposure, one can assume that prior to being drawn by the partnerships, and after having been distributed back to the investor, cash amounts are invested in a liquid asset class, such as short-term treasuries. For the sake of simplicity, it is assumed these investments are risk free ($\sigma_r = 0$) and show an expected return r . As a consequence, the change in total wealth is caused by the successive exposure to short-term treasuries with return r , private equity with return μ_{PE} and short-term treasuries with return r - again as depicted in

Figure 1.

Assuming cash inflows I_i at times T_i and cash outflows O_j at times T_j , it is possible to adjust the cash flows for the investment period in the risk-free asset and to obtain the initial wealth W_0 and terminal wealth W_T



$$W_0 = \sum_i I_i \text{Exp}(-r (T_i - T_0))$$

$$W_T = \sum_j O_j \text{Exp}(r (T - T_j))$$

Looking at the average and standard deviation of the ratios W_T/W_0 , one can derive the expected return μ and volatility σ of the combined investment strategy. Assuming an average exposure to private equity for a time T_{PE} , a private equity return μ_{PE} and a private equity volatility σ_{PE} , the equations for the return and volatility of the combined strategy would look like this:

$$\mu T = r (T - T_{PE}) + \mu_{PE} T_{PE}$$

$$\sigma^2 T = \sigma_r^2 (T - T_{PE}) + \sigma_{PE}^2 T_{PE} .$$

Solving this system of equations for T_{PE} and σ_{PE} (while keeping in mind that $\sigma_r = 0$) yields the following:

$$T_{PE} / T = (\mu - r) / (\mu_{PE} - r)$$

$$\sigma_{PE} = (T / T_{PE})^{1/2} \sigma = [(\mu_{PE} - r) / (\mu - r)]^{1/2} \sigma$$

In this scenario, the expected private equity return μ_{PE} corresponds to the pooled IRR of the private equity dataset obtained after scaling all the partnerships to the same size.

So how volatile is private equity?

Based on a proprietary database consisting of the cash flows until the end of 2001 of over a hundred private equity partnerships with vintages between 1980 and 1990, the following results are obtained:

$$T_{PE} = 4.8 \text{ years} \quad \mu_{PE} = 14.3\% \quad \sigma_{PE} = 34.4\%$$

The average holding time - T_{PE} of 4.8 years - is in line with practitioner's experience. The average return - μ_{PE} of 14.3 per cent - is comparable to public equity returns for the period from 1980 to 2001, whereas the volatility - σ_{PE} of 34.4 per cent - turns out to be about twice as high as public market index volatility. To illustrate this last point, the S&P500 total return index showed an average return of 13.9 per cent for a volatility of 15.6 per cent over the same period. Does this mean that private equity is twice as risky? Not really, as it is important to realise that σ_{PE} does not stand for the volatility of private equity as an asset class, but for the volatility of a single partnership investment, which one would expect to be riskier than an investment in a broadly diversified index.

By spreading the investment over a given number of private partnerships so as to obtain a similar level of diversification as a public benchmark, one can produce private equity volatility data comparable to volatilities of the public equity markets. This can be achieved by running a Monte Carlo simulation, where a given number of individual private equity partnerships are sampled at random to represent a more diversified portfolio, before applying the methodology described above.

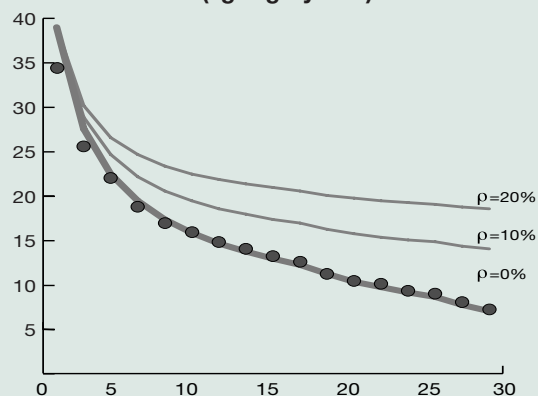
Figure 2 represents the actual volatility decay as a function of the number of partnership measured with the help of this simulation method. Diversifying the original investment in six different partnerships already reduces the volatility σ_{PE} to 16.0 per cent, a figure comparable to the market volatility of the S&P500. Readers should note that the numbers in this article are provided for illustrative purposes, and that a more accurate public versus private volatility comparison would require applying the same methodology to both markets, so as to avoid methodology bias. Still, these results are very helpful for comparing the relative long-term volatility reduction achieved by spreading investments in different partnerships.

How correlated are private equity partnerships?

Measuring the decay of the volatility σ_{PE} as a function of the number of partnerships, effectively estimates the correlation between private equity partnerships without relying on time-weighted returns. The volatility of a homogeneous

Figure 2

Decay of volatility σ_{PE} as a function of number of partnerships (dark gray dots). Theoretical decay with 0% (light gray bold), 10% and 20% correlation factors (light gray thin).



portfolio comprising N assets with volatility σ jointly linearly correlated with correlation factor ρ reads (***):

$$\sigma_N^2 = \sigma^2 (1 - \rho) / N + \sigma^2 \rho .$$

The first term, $\sigma^2 (1 - \rho) / N$, can be regarded as idiosyncratic risk and corresponds to the part of the risk that can be diversified away by increasing the number of assets. As the formula shows, diversifiable risk decreases with the square root of the number of assets in the portfolio. The second term, $\sigma^2 \rho$, stands for the systematic risk associated with private equity, which cannot be diversified away. Comparing the decay of σ_{PE} as a function N with the curves corresponding to the theoretical decays obtained with 0 per cent, 10 per cent and 20 per cent correlation in Figure 2 indicates that the long-term correlation factor at the partnership level is close to zero.

One key conclusion to draw from this analysis is that, given the low statistical correlation between partnerships, the private equity investor can achieve significant risk reduction through portfolio diversification. Typical ways to achieve sufficient diversification include investing in a basket of private equity partnerships or in fund of funds vehicles. In doing so, the investor has a statistically better chance of obtaining risk-adjusted returns appropriate to the asset class.

Christophe Rouvinez is a partner in Capital Dynamics, an asset management firm that specializes in private equity with offices in Zug, Switzerland and New York.

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