What is the optimal allocation to private equity?

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What is the optimal allocation to private equity?

**KEY STATEMENTS**

- Although it is hotly debated, modern portfolio theory still represents a major tool for portfolio construction. Today, there are data providers that track the private equity market and two decades worth of quarterly data is a sound statistical basis for portfolio optimization.

- Data is based on the valuation of private companies and corresponding cash flows. Private company valuations typically reflect fair asset values rather than actual transaction values. Although similar tools are used to value public and private companies, the frequency and focus of valuations vary significantly. As a consequence of private equity valuation mechanics, return series exhibit auto-correlation, which, if not corrected for, may distort the results of portfolio optimization.

- Based on historical data series adjusted for auto-correlation, modern portfolio theory suggests an optimal private equity allocation in the range of 10-30% for an unconstrained investor depending on risk tolerance.

- Modern portfolio theory neglects important parameters such as investment selection, liquidity and regulations. Profound investment selection skills and access to top quartile managers are key given the significant return dispersion in private markets. Uncertainty over cash flows of private markets investments requires sophisticated modeling techniques for both risk management purposes as well as portfolio and liquidity management. Last but not least, regulation substantially limits degrees of freedom in asset allocation.
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EXECUTIVE SUMMARY

Determining overall asset allocation is one of the first and major challenges an investor faces, well before actual investment decisions are made. Looking at the private equity target allocation in the portfolios of institutional investors, one observes a significant variation between European pensions funds, with no or low single-digit allocations, and U.S. institutional investors with allocations in the mid-teens (CalPERS, for example, at around 15%) to over 20% (for various U.S. endowments funds such as Harvard or Yale). Apparently, there is no consensus regarding the optimal private equity allocation. What causes these large differences? Is there one single optimal allocation or is it investor specific?

While modern portfolio theory is well established in the context of public market assets such as stocks and bonds, an initial stumbling block for private equity is the access to and the appropriate use of input data. Thomson Reuters, for example, collects and provides long-term cash flow and return data for private equity, which may be used for quantitative studies including diversification. However, such data typically exhibits auto-correlation, which smoothes out volatilities and correlation and, if not corrected for, would increase the optimal allocation to private equity. Un-smoothing the time series for this effect still provides for an allocation to private equity in the range of 10-30% for an unconstrained investor depending on risk tolerance.

Standard portfolio optimization neglects important aspects. First, private equity investments are subject to a significant return dispersion across investment opportunities. Positive or negative selection biases impact returns significantly and need to be considered in the allocation decision. Second, investors only earn returns on invested capital, which may and often does deviate significantly from the target allocation; investors therefore need to carefully analyze the impact and opportunity costs of a potential dilution. Third, in the aftermath of the financial crisis, institutions across the globe are facing tighter regulations, which will either change the cost of capital associated to different asset classes (risk-based capital requirements for insurance companies, e.g. Solvency II in Europe) or introduce outright limits (e.g. Volcker rule).

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1 Portfolio Selection, Harry M. Markowitz, Journal of Finance 7, 1952, p. 77-91
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OPTIMAL ALLOCATIONS: WHAT DO TEXTBOOKS TELL US?

Modern portfolio theory strives to optimize an investor’s allocation across asset classes and in consideration of the investor’s risk tolerance. The parameters risk (measured as volatility), returns and correlations are the input variables to optimize the return for a given risk. Exhibit 1 illustrates the efficient frontier for a traditional portfolio consisting of stocks and bonds only. All portfolios along the curve are "efficient" in the sense that investors cannot create a non-levered portfolio with the same return but a lower risk, or the same risk but a higher return. Herein we will focus on the Minimum Variance portfolio (i.e. the portfolio with the lowest risk) and the Maximum Sharpe portfolio (i.e. the portfolio that maximizes the Sharpe ratio\(^2\)). Calculating these optimal allocations for portfolios containing only public stocks and bonds results in a bond allocation of around 80% (Minimum Variance portfolio) and 75% (Maximum Sharpe\(^3\) portfolio) based on historical data.

Exhibit 1: Standard efficient frontier for a simple public market portfolio

While modern portfolio theory is still one of the major tools for portfolio construction, it is hotly debated amongst both practitioners and researchers. People question to what extent the assumptions of standard portfolio optimization are justified or violated. In addition, the composition of optimal portfolios might not always seem feasible. When moving along an efficient frontier (i.e. for varying risk tolerances), the portfolio composition can change substantially with just a small move of the target risk and the portfolio composition often even completely neglects entire asset classes. This sensitivity makes portfolio optimization more of an art than a science and the results should often be considered as general guidance rather than a strict directive. The recent financial crisis painfully demonstrated that asset allocation should not depend solely on quantitative models and historical time series. Additional parameters such as duration and liquidity must be taken into consideration. Last but not least, investors need to carefully analyze the availability and characteristics of input data.

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\(^3\) The Sharpe ratio is a measure for risk-adjusted performance and is defined as the expected excess return of an asset over the risk-free rate divided by the asset’s volatility
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PRIVATE EQUITY VALUATIONS, FLAWED OR TRUSTWORTHY?

High quality return data for stocks and bonds is available for long time periods and for nearly every frequency. In order to add private equity in an asset allocation context, investors often face the challenge of incorporating relevant historic data into their models. Today, there are several data providers that track private equity data. It is, however, important to analyze the differences between private and public market valuation mechanics.

Exhibit 2 shows the mechanics and tools that are used to value public and private companies. Not surprisingly, the same tools are used and in both cases investors are trying to assess the value of a company. The frequency of valuations, however, varies significantly: real-time quotes in information systems like Bloomberg suggest that the valuation of a public company changes instantaneously. In contrast, private market investments are typically only valued on a quarterly basis or once they are transacted, which may happen only every few years. In addition, while valuations for public companies are typically based on projections by stock analysts, private equity valuations are generated by the owners of the company based on all information about the current status and the anticipated development of the company (“legal insiders”). Often these private market valuations are based on trailing performance figures (“current value approach”).

<table>
<thead>
<tr>
<th>Exhibit 2: Public and private market valuations make use of the same tools, but have a different focus</th>
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<tbody>
<tr>
<td><strong>Public markets approach</strong></td>
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<tr>
<td>Short term sentiment</td>
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<tr>
<td>Instantaneous valuations</td>
</tr>
<tr>
<td>Projections into the future</td>
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<td>(&quot;forward P/E&quot;)</td>
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While the focus and frequency of these valuations may differ, the valuation tools largely coincide. Because private companies’ valuations are supposed to reflect the fair asset value rather than an actual transaction value, one might argue that the valuations of private companies are flawed (and should not be used for portfolio optimization). We argue that private equity valuations are generally no worse at reflecting prevailing company values than public market valuations. Naturally, one would expect valuations to depend on the general well-being of the economy as both private as well as public companies generally fare better in a benign economic environment. This is confirmed by the valuation ratio, which we define as positive valuation changes over negative valuation changes of private investments (i.e. similar to the bull/bear ratio known in public markets). We compare the valuation ratio with GDP growth in Exhibit 3 and find that private equity valuations are indeed moving largely in line with GDP growth. Some investors fear that general partners planning to raise the next fund might be tempted to inflate the valuations in order to show a better track record; however, research has shown that there is no positive bias in the valuations of private equity investments.

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One also observes that private market valuations are not necessarily adjusted on a quarterly basis if there is no significant change of the underlying company’s performance figures (e.g. EBITDA). We measure that up to 40% of valuations remain unchanged each quarter on average. This is not an issue for strategic private market investors who appreciate the long-term nature of the asset class and do not demand a tradable price as in public markets. This long-term focus of private equity valuations causes an auto-correlation in return series. In essence, this means that the quarterly return for period T+1 is correlated with the return of period T (and potentially previous periods). While we claim that private market valuations are relevant for modeling purposes, the auto-correlation should be addressed for our portfolio optimization.

Exhibit 3: Private equity valuations are moving in line with GDP

Quarterly valuation ratio calculated as number of positive valuation changes to negative valuation changes compared to GDP.

OPTIMIZING FOR PRIVATE EQUITY

While high frequency data of return time series of stocks and bonds exhibit auto-correlation, statistical tests for auto-correlation are typically not significant for broad index data at monthly or quarterly frequencies. In contrast, alternative asset classes such as private equity (as well as several hedge fund strategies) exhibit auto-correlation even at quarterly frequencies. The fact that quarterly returns are thus, to some extent, dependent on the returns observed in previous quarters smooths time series and reduces the measured volatility and the correlation with other asset classes. Since volatility and correlation are the input variables for portfolio optimization, auto-correlation in time series would naturally impact the result of portfolio optimization.
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There are techniques that allow for the "un-smoothing" of time series (see Conner\(^5\), for example). Using these methods, one can determine an adjusted volatility and adjusted correlation of the underlying economic process and use these underlying parameters as input variables for portfolio optimization rather than original private market return series.

Even based on adjusted parameters, modern portfolio theory suggests an 11% allocation to private equity for the Minimum Variance portfolio and a 27% allocation for the Maximum Sharpe portfolio (see Exhibit 4) based on adjusted historical data. Interestingly, public equities do not receive any allocation in these two portfolios and private equity basically takes the place of public equity. For long-term investors with corresponding risk profiles and a high tolerance vis-à-vis illiquidity, such a move may actually make sense. As initially discussed, investors will need to base their portfolio allocation not only on historical data but also on their outlook of expected future returns.

Exhibit 4: Optimal allocations for portfolio with traditional and alternative assets

<table>
<thead>
<tr>
<th>Private equity figures denote broad pooled average buyout industry returns with North America and Western Europe being equally weighted. Series are corrected for auto-correlation.</th>
<th>Maximum Sharpe</th>
<th>Minimum Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citigroup World Gov Bonds</td>
<td>56%</td>
<td>64%</td>
</tr>
<tr>
<td>MSCI World Total Return</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>CS/Tremont Hedge Fund Index</td>
<td>17%</td>
<td>25%</td>
</tr>
<tr>
<td>Private Equity</td>
<td>27%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Source: Bloomberg (quarterly returns in local currencies), Thomson Reuters (Cash flow summary report), period 1/1/1994 – 30/06/2010

IT’S NOT THE END OF THE STORY

As mentioned before, modern portfolio theory focuses on volatility, returns and correlations as input parameters. In our opinion, there are, however, various dimensions not covered in this framework that are very important in the actual asset allocation decision.

Portfolio optimization is typically based on long-term broadly diversified industry data. This does not take into account a potential positive/negative selection bias. As a matter of fact, private equity exhibits a large dispersion between top and bottom performers. The data from Thomson Reuters illustrated in Exhibit 5 underlines the importance of this investment selection. Comparing North American buyout industry returns with the S&P 500 shows that the broad buyout market outperforms the S&P 500 by around 300 basis points. An investor that is able to identify and avoid bottom-quartile investment opportunities is able to increase the outperformance to nearly 5%; if such outperformance is factored in, the investor would naturally increase the allocation to private equity in a Maximum Sharpe portfolio. On the other hand, an investor that is not able to identify and access top quartile opportunities is likely to underperform a public market portfolio; if such underperformance is factored in, there would consequently be no private equity allocation in the optimal portfolio.

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Exhibit 5: Industry data does not account for an investment selection bias

Positive selection bias refers to the pooled performance of funds that are not in the bottom quartile. Negative selection bias refers to the pooled performance of funds that are not in the top quartile.

| Source: Thomson Reuters (NAM BO fund performance report as of June 30, 2010) and Bloomberg (S&P 500 TR since 1994) for public markets. |

The uncertainty of cash flows of private markets investments adds another dimension in our portfolio optimization effort. Using sophisticated modeling, investors need to estimate their future cash flows based on their prevailing portfolio and their unfunded liabilities; actual cash flows will depend on many exogenous factors. The input data used for the optimization implicitly assumes that the investor is always fully invested. Given the uncertainty of future cash flows, investors, however, face the difficulty of achieving and maintaining their target investment level over time. Opportunity costs from being under- or overinvested can be significant due to the illiquidity of the asset class and the substantial discounts possible in the case of forced secondary sales, which may erase the entire return benefits. It is clear that portfolio optimization of industry data does not take these opportunity costs into account.

Further important factors to be considered for portfolio optimization include liquidity considerations and regulations. Regulators world-wide are imposing new rules for insurance companies that shift the focus from asset-based capital requirements to risk-based capital requirements. Similarly, banks are facing additional capital requirements from Basel III and the Volcker rule. These regulations will further restrict degrees of freedom in asset allocation.
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CONCLUSION

What is the optimal allocation to private equity? From a standard portfolio optimization point of view, an unconstrained investor may allocate 10% or even up to 30% of overall assets to private equity. Individual investors’ preferences, different levels of investor sophistication and regulations will however continue to yield very different answers to this question in practice.
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