Invesco Vision Case Study 3: Relative risk optimization

Optimizing with a reference portfolio

A reference portfolio is a hypothetical simple diversified portfolio, implemented with passive, low-cost, liquid investments, designed to achieve specific investment goals. Reference portfolios are frequently used by pension plans as a baseline to measure investment performance and to manage risk in the pursuit of returns. The reason for the adoption of a reference portfolio framework is that it provides greater flexibility than bucketed benchmark approaches. In these situations, plans are faced with two options. First, they can construct an allocation and compare it directly to the reference portfolio in an absolute context. Alternatively, plans can develop portfolios using a relative optimization framework. The latter approach offers a few benefits when a plan seeks to avoid performance that deviates substantially from that of the reference portfolio. In this example, we assume the reference portfolio is comprised of 70% MSCI World Index and 30% Bloomberg Barclays Global Aggregate Index. We also assume that the asset owner has a broad array of assets at their disposal as they attempt to deliver higher returns than the reference portfolio. To simplify the exercise, we assume all assets, including the reference portfolio are currency hedged.

Figure C3a shows the reference portfolio and a robust efficient frontier in an absolute risk context. Not surprisingly, based on our return assumptions, the efficient frontier indicates that we are able to produce a portfolio with either higher return for the same amount of risk as the reference portfolio or lower risk for the same amount of return as the reference portfolio. Selecting the higher return option, we notice that the actual portfolio, despite similar absolute risk levels, has meaningfully different factor exposures than the benchmark. This is a direct result of the optimizer finding allocations that have higher return with similar relative risk as it exploits various correlations.

In Figure C3b we consider the problem in relative terms. The reference portfolio now sits at the origin with no risk and no return. The figure also includes two frontiers. The dotted light-blue frontier is the frontier we created in the first figure but displayed on the relative axes. Interestingly, the relative risk (tracking error) of the portfolio we focused on in the top figure is close to 5%. This means that while the portfolio we chose may have similar risk as the reference portfolio, we should still be prepared for meaningful performance deviations. Plan sponsors may not be comfortable with such deviations, despite the higher expected returns.

To address the above challenge, we then go on to create a frontier that is efficient in relative risk terms which is indicated in solid blue. This frontier is more efficient than the absolute frontier with improvements becoming most prominent at lower relative risk levels. More specifically, we notice that we are now able to identify allocations that are expected to track the reference portfolio with less than 1% relative risk. By selecting the lowest risk allocation, we see that it is in fact comprised of an allocation that looks very similar to the underlying constituents of the reference portfolio (i.e., Treasuries, Corporates, MBS, US equities and EAFE equities). While this is encouraging, this point itself may not be of interest, as it also does not offer any excess return to the reference portfolio. However, as we move up the efficient frontier, we are able to identify solutions that are expected to outperform the reference portfolio while minimizing tracking error. For example, if we look directly to the left of the portfolio we evaluated in the context of absolute risk, indicated as the Optimal Absolute Risk Portfolio, we are able to identify a solution with the same return but with 1% lower tracking error.

It is important to note that this type of approach can be applied to other similar types of problems. For example, plan sponsors and corporate entities are often very sensitive to how they are positioned relative to their peers. In such cases, while they may not build their portfolio entirely around what their peers are doing, knowing how they are expected to perform relative to peers can provide meaningful insights and may also lead to a re-evaluation of some of their outlier bets.

Figure C3a: Absolute risk optimization – Reference portfolio
Robust optimization without considering reference portfolio

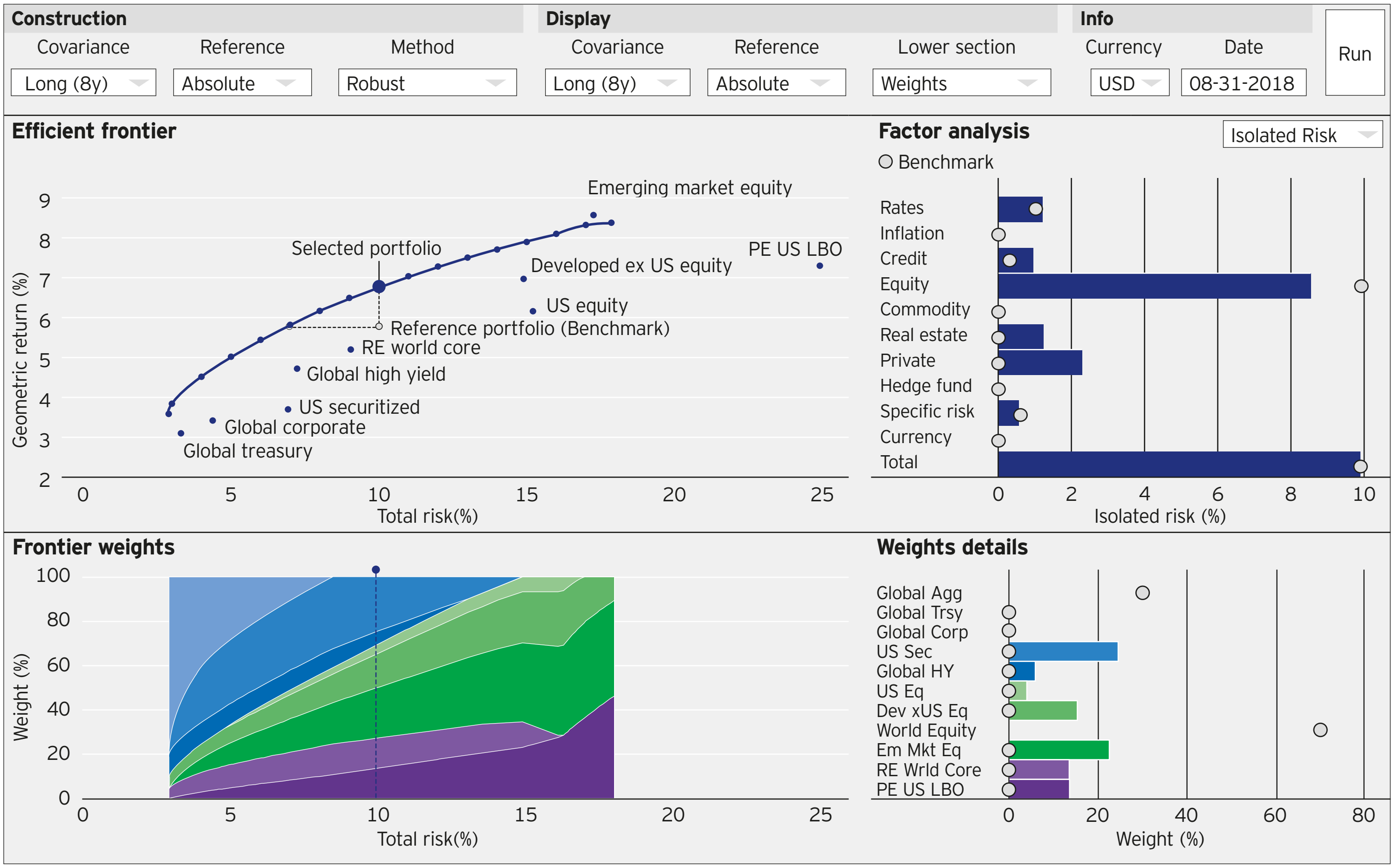
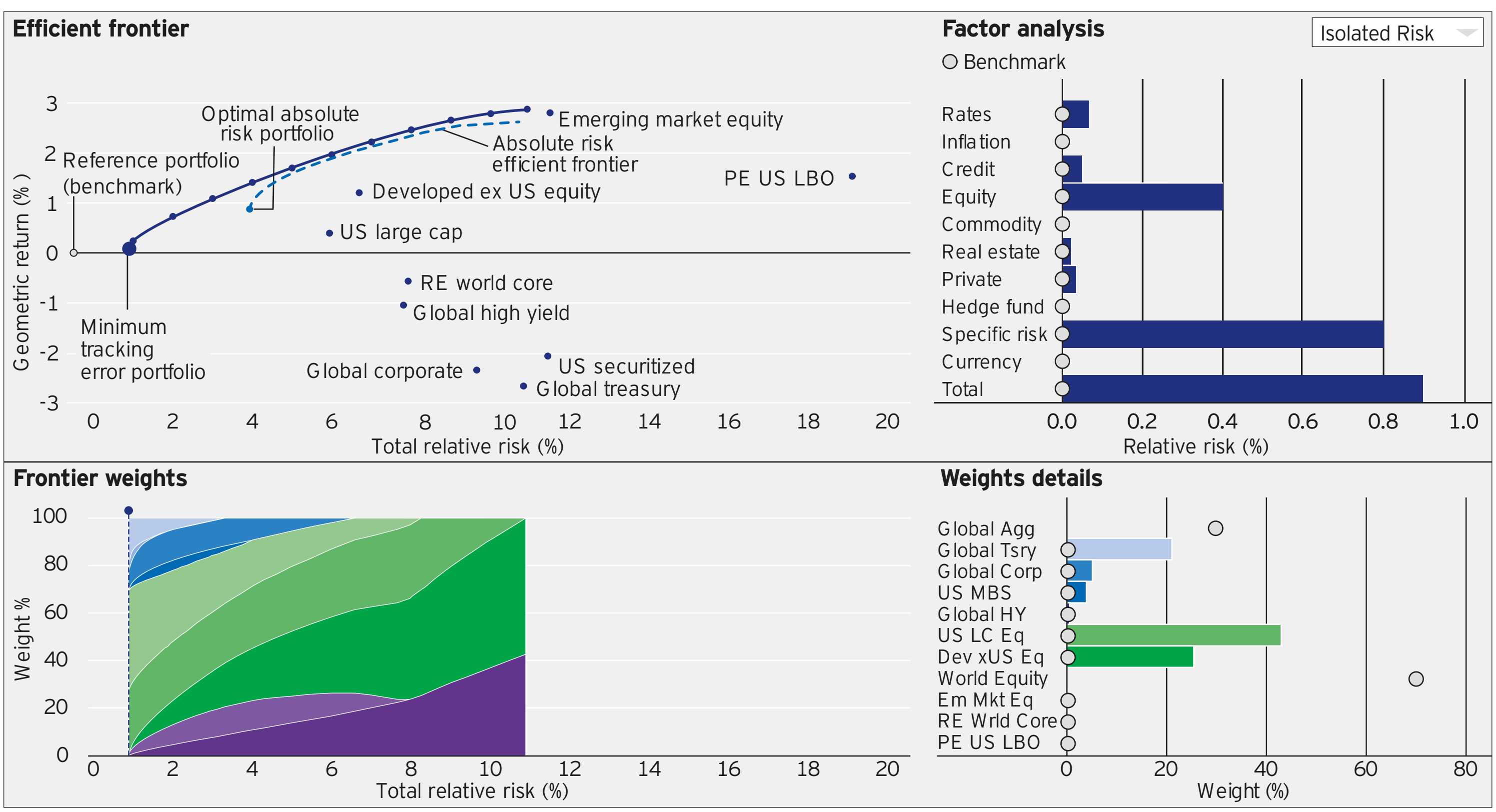


Figure C3b: Relative risk optimization – Reference portfolio
Comparison with frontier optimized relative to reference portfolio



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