Invesco Vision Case Study 14: Return agnostic solutions

Portfolio construction without expected returns

While it is common practice to create portfolios through some form of mean-variance optimization, there are several other approaches that can be employed. Most of the approaches are aimed at eliminating the dependence on expected returns, which are the hardest optimization inputs to forecast correctly. In this example, we construct five such portfolios: equal weight, equal volatility, equal risk contribution, max diversification and global mean variance. To keep the example simple while trying to get exposure to a diverse set of factor exposures, we use three assets: US Large Cap (S&P 500), US Long Treasuries (Bloomberg Barclays Long Treasury) and Commodities (Goldman Sachs Commodity Index).

In Figure C14a, we chart the individual assets, the five return-agnostic portfolios, and the mean-variance efficient frontier with total risk (standard deviation) on the x-axis and geometric mean on the y-axis. What is immediately evident is that, while many of the return agnostic portfolios are near the mean-variance efficient frontier, the only portfolio that truly resides on the frontier is the global minimum variance portfolio. This reminds us that we can always construct an efficient portfolio that has the minimum risk without requiring any views on expected returns. The lower portion of Figure C14b summarizes the asset weights, isolated risk and contribution to risk for each of these solutions.

The simplest portfolio to create is the equal weight solution. In this case, the weights are simply derived by dividing 100% by the number of assets. An examination of the isolated risk and contribution to risk for this portfolio shows that even though the portfolio appears to be well diversified, commodities play an oversized role in the risk of the portfolio. This is a function of the amount of risk for each of the assets included. It should be noted that while the notion of this type of naïve diversification can be of interest, investors should evaluate the assets to be included carefully. Consider a three-asset equal weight portfolio where two assets are close substitutes, such as a S&P 500 ETF, a Russell 1000 ETF and a US Aggregate bond ETF. In such an instance, naïve diversification may actually lead to greater concentration and a higher exposure to risk than might be expected.

The equal risk, or risk-parity portfolio as it is sometimes called, is also a straightforward solution with the weights being set to be inversely proportional to the asset volatility. In this case, we see how the commodities sector gets the lowest weights, followed by stocks, and then bonds.

We then move to the portfolios whose weights can no longer be algebraically derived. First, we look at the equal risk contribution portfolio. This solution differs slightly from the equal risk solution, as it also considers asset correlations. As can be seen, the isolated risks are no longer the same, with commodities having the least isolated risk.

Moving to the maximum diversification solution which has the objective of maximizing the diversification ratio. This ratio is defined as the weighted average of the volatilities divided by the portfolio volatility. Here we see how stocks and commodities both have lower isolated risk and contribution to risk than fixed income.

Finally, we examine the global minimum variance portfolio. The objective here is to identify the portfolio with the lowest risk. This approach has recently received significant attention, specifically when looking at constructing portfolios within a specific asset class. The reason for the increased interest in this approach is that adacemic literature has put forward the idea that such a portfolio may not only exhibit lower risk, but it may also offer a premium. This may not necessarily be the case within a multi-asset context and in most cases. We treat this solution mostly as a reference point.

All of these portfolios can be viewed as reasonable options to consider when there is low confidence in the ability to effectively forecast expected returns and should be part of an investor's toolkit. They can also be useful as a reference for comparison for portfolios under consideration.

Figure C14a: Return agnostic solutions with mean-variance efficient frontier
Return and risk comparison

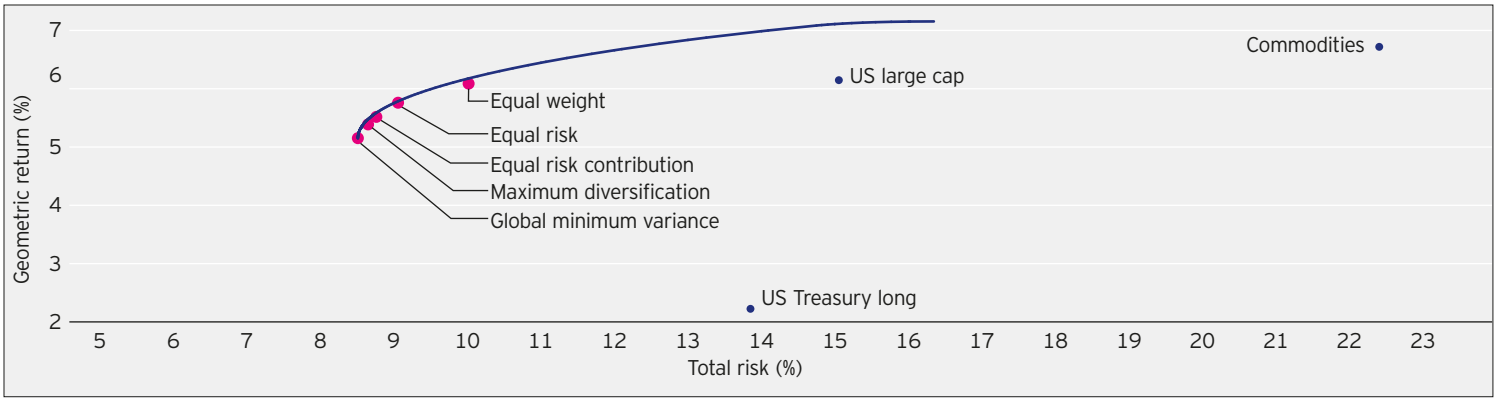
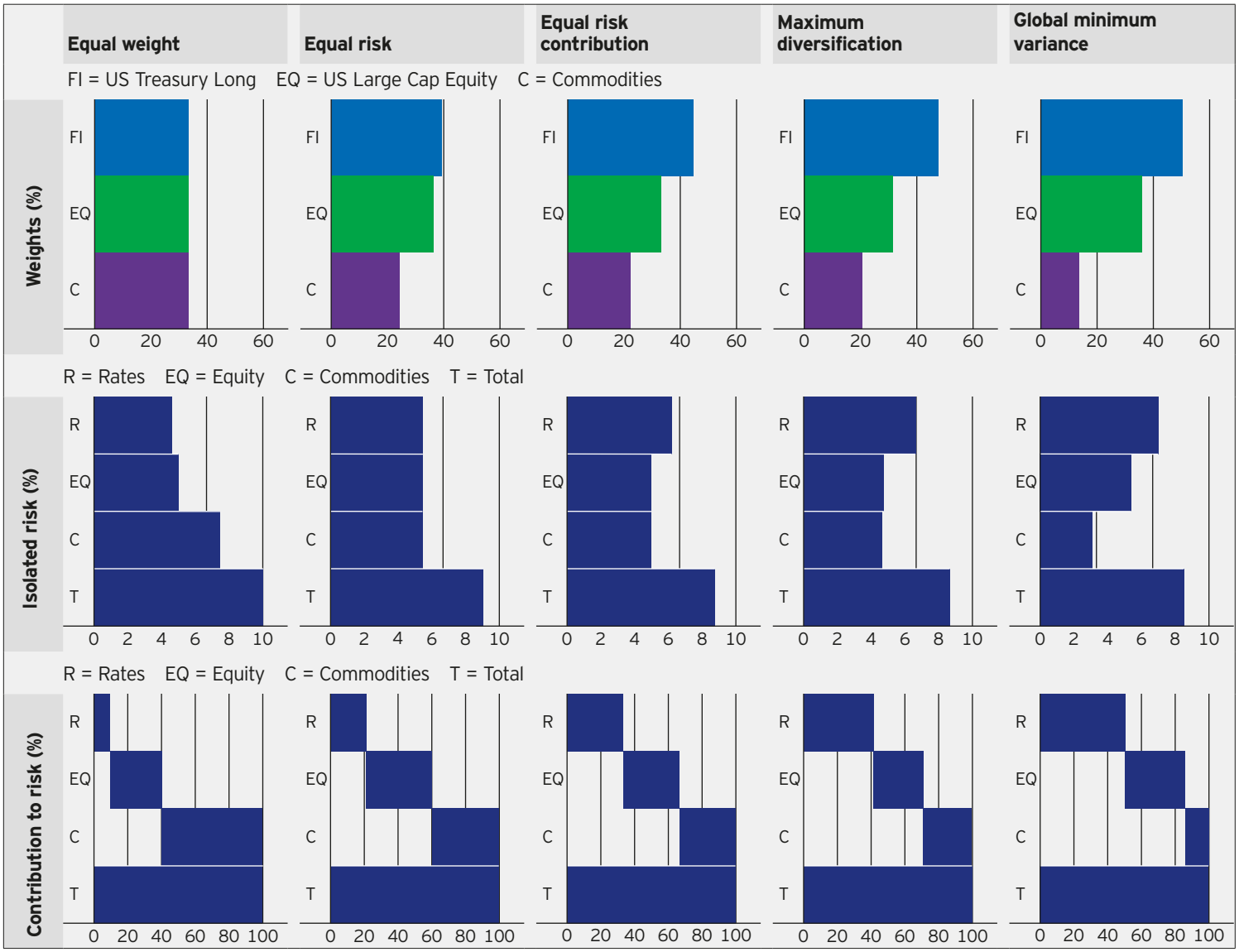


Figure C14b: Portfolio Characteristics
Portfolio weights, isolated risk, and contribution to risk



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