Diversification Isn't All That Matters

The improvement in a portfolio's efficiency from diversification depends on the assets' expected returns, volatilities and correlations. Too often, investors address each separately.

Nobel Prize winner Harry Markowitz described diversification as "the only free lunch in finance." His mathematical framework demonstrates how the combination of two uncorrelated assets would be less volatile than either alone, and extends the concept to constructing "efficient" portfolios.[1] Often investors assume they will always benefit from adding a "diversifying asset." This is not correct. Adding a diversifying asset will make a portfolio's sources of risk less concentrated. But investors care about both risk and return. If the diversifying asset's expected return is too low or its volatility is too high, adding it will worsen, rather than improve, the portfolio's risk/return profile.

This Viewpoint looks at correlations, expected returns and estimated volatilities, and illustrates that all three metrics are necessary for investors seeking to construct efficient, risk-aware portfolios.
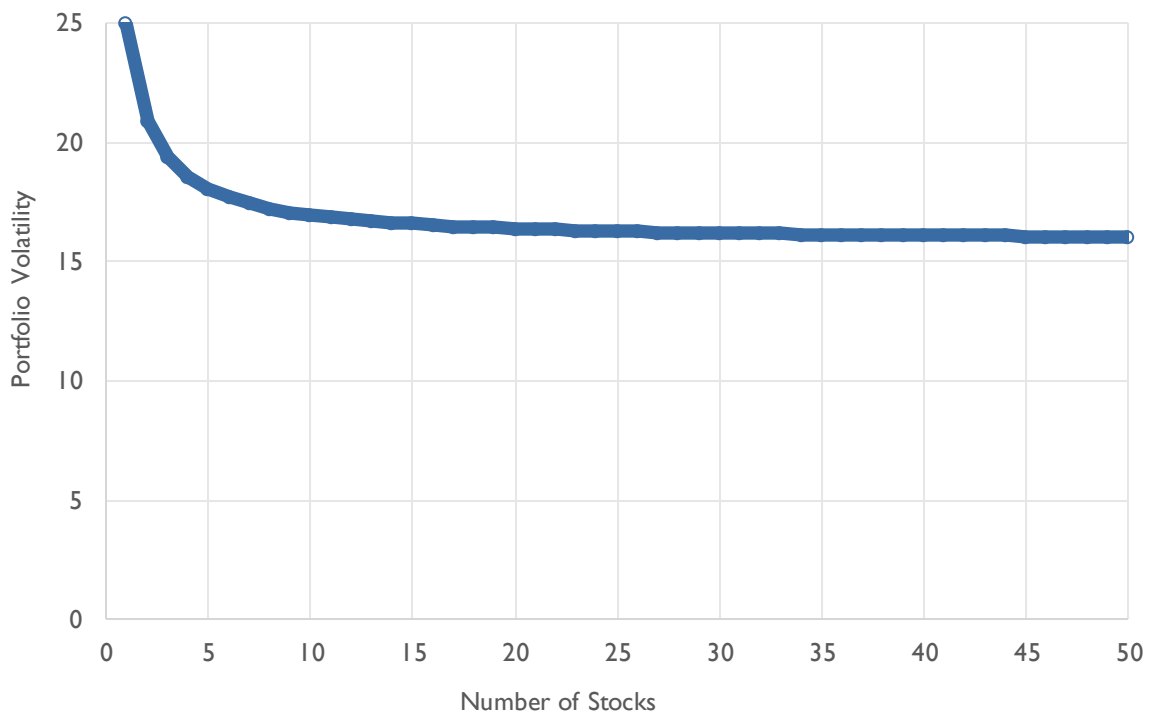
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Diversification Illustrations

Chart 1 illustrates the intuition behind diversification. It shows that as more stocks (with idiosyncratic risks) are added to a portfolio, the portfolio's expected risk declines. The stocks' volatilities in this example are 25% (i.e., the stocks are all 'risky') and the cross-correlations are 0.5 (i.e., their risks are similar but not identical). The chart illustrates how the portfolio's volatility comes down as stocks are added. With 30 stocks, the portfolio's volatility is 16.2%.


Chart 1: Adding Stocks Reduces Portfolio Volatility

Source: Alan Biller and Associates

Chart 2 shows the power of adding diversifying assets to a portfolio. The blue line is an efficient frontier showing the expected returns and risks of portfolios that include only US large cap stocks, Core bonds and cash. The green line shows the efficient frontier when a broader opportunity set[2] is allowed. The gap between the two lines shows the power of diversification. With the expanded set of assets, a portfolio with 10% volatility has a 108 basis point higher expected return (7.72% vs 6.64%). Alternatively, the investor can obtain an expected return of 6.5% with a volatility of only 9.00% when the broader opportunity set is allowed, versus 9.37% with the more constrained portfolio.

Chart 2: Stocks, Bonds & Cash Efficient Frontier versus Expanded Opportunity Set
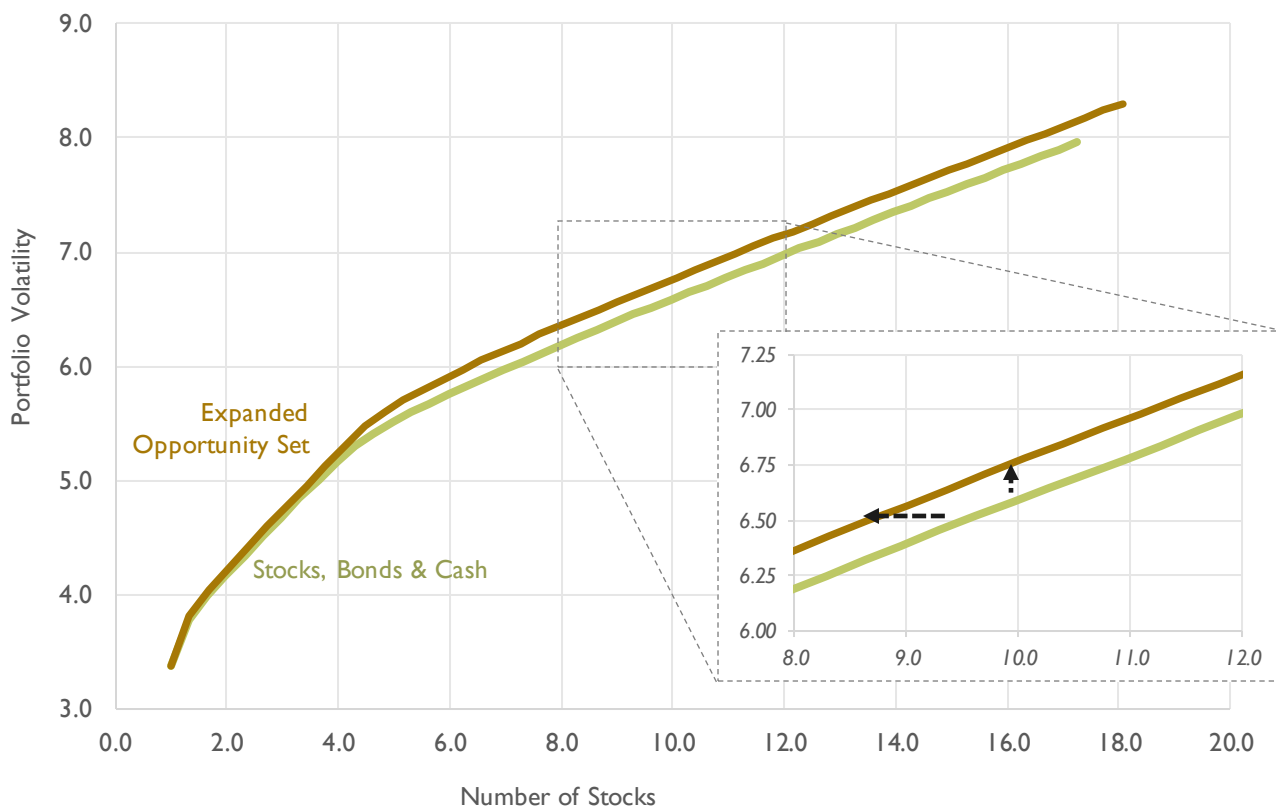
Source: Alan Biller and Associates

The key element to note is that the improvement in a portfolio's efficiency depends on the assets' expected returns, volatilities and correlations. These metrics combine to determine how the addition of an asset class affects a portfolio's expected risk and return. Too often investors seem to address each statistic and asset separately. With respect to correlations, some investors will behave as if adding a "diversifying asset" (i.e., one that is uncorrelated with the other assets in the portfolio) is always a good thing. In this Viewpoint, we demonstrate why that is not necessarily the case.

Examples: Hedge Fund and Commodities allocations

Some investors' asset allocations include an "uncorrelated asset" bucket that includes Hedge Funds and other zero-beta investments. While "zero-beta" is a good thing, if the Hedge Funds' expected returns are too low, incorporating them into the asset allocation will reduce portfolio efficiency, not improve it. Similarly, Commodities are often included because of their diversifying characteristics.[3] However, Commodities have high volatility, and some investors may believe they have low expected returns, in which case they should not be in the strategic allocation.

Tables 1 and 2 give examples of how adding Hedge Funds or Commodities to a fund's strategic asset allocation might affect its risk and return characteristics. The starting point for both analyses is a sample , Representative Portfolio. It includes the expanded opportunity set shown in Chart 2. The portfolio characteristics are calculated using our 12/31/2022 Capital Market Assumptions. For these analyses, we will allocate 10% of the portfolio either to Hedge Funds or to Commodities and proportionately reduce the portfolio's other allocations.

Adding Hedge Funds

The expected return of the Representative Portfolio is 6.37% with a volatility of 10.1%. This results in a 0.31 initial Sharpe ratio (excess return / volatility).[4] Table 1 examines the effects of adding Hedge Funds

- If Hedge Funds have an expected return of 7.5%, including them in the strategic asset allocation (SAA) is additive.[5] It increases the portfolio's expected return to 6.50% and reduces its risk to 9.9%. This increases the Sharpe ratio to 0.32.

- If Hedge Funds have an expected return of 6% (modestly less than our expectation for US large cap equities), there is a slight decrease in both the portfolio's expected return and risk. The Sharpe ratio is unchanged.

- If Hedge Funds have an expected return of only 5% per annum (approximately 1.7% more than cash), the portfolio's expected return falls to 6.25% and the Sharpe ratio to 0.30.

- For investors that are skeptical of hedge fund managers' ability to add value, an expected return of just 3.5% (0.2% above that of cash), will lower the portfolio's expected return to 6.1% and its Sharpe ratio to 0.28.

Table 1: Adding Hedge Funds

	Geometric Expected Return	Portfolio Volatility	Sharpe Ratio
Representative Portfolio	6.37%	10.1%	0.31
7.5% Expected Return	6.50%	9.9%	0.32
6.0% Expected Return	6.35%	9.9%	0.31
5.0% Expected Return	6.25%	9.9%	0.30
3.5% Expected Return	6.10%	9.9%	0.28

Source: Alan Biller and Associates

Adding Commodities

Table 2 is an analysis of adding a 10% Commodity allocation to the Representative Portfolio. In these examples, we vary both Commodities' volatility and expected return. Our current expectation of Commodities' volatility is 18%. Using that volatility assumption, investors that expect Commodities to return 6% or more [6] should add them to their asset allocations. It will both increase their portfolios' expected return and reduce their volatility. However, if the expected return is less than 5%, adding Commodities will reduce the portfolio's expected return and Sharpe ratio.

If an investor believes that the volatility of Commodities will remain high,[7] adding 10% to Commodities will increase the volatility of the portfolio even though the correlation of commodities and stocks (the primary driver of portfolio' volatility) is low. At a volatility assumption of 25%, the portfolio's volatility will increase to 10.3%. The expected returns we use for Commodities in the bottom four rows are lower than the previous four. That is because the calculations assume that the arithmetic returns are the same as in the 18% volatility examples. The drag from the higher volatility lowers the geometric (compound) returns.[8] Using those assumptions, an expected return of less than 5% will reduce the portfolios' Sharpe ratios.

Table 2: Commodity Allocation

	Commodity Geometric Expected Return	Portfolio		
		Geometric Expected Return	Portfolio Volatility	Sharpe Ratio
Representative Portfolio		6.37%	10.1%	0.31
18% Volatility	7.50%	6.59%	9.9%	0.33
	6.00%	6.44%	9.9%	0.32
	5.00%	6.34%	9.9%	0.31
	3.50%	6.20%	9.9%	0.29
25% Volatility	6.30%	6.56%	10.3%	0.32
	4.77%	6.41%	10.3%	0.30
	3.74%	6.31%	10.3%	0.29
	2.21%	6.16%	10.3%	0.28

Source: Alan Biller and Associates

Summary

A low correlation with other assets is an attractive characteristic of an asset class. The less concentrated the sources of a portfolio's risk, the more diversified the portfolio. Yet diversification alone is not sufficient to make an asset class attractive.

- If the proposed asset's <u>volatility</u> is too <u>high</u>, it can increase the risk of a portfolio despite the low correlations.

- If the proposed asset's <u>expected return</u> is too <u>low</u>, adding it to the portfolio can reduce the portfolio's expected return. This can more than offset the risk-reduction benefit of the low correlation.

When an investment manager touts an asset class's diversifying characteristics, be sure that it improves your portfolio's efficiency.

Endnotes

1. Efficient portfolios are portfolios that lie on the efficient frontier. The efficient frontier is the set of portfolios that provide the highest expected return for each level of risk. Note that the Markowitz mean-variance model is only an approximation of investors' preferences. A partial list of potential deviations includes: return distributions may be skewed or have fat tails; some investors have a preference for downside protection; some investors have multiple investment horizons. In such cases, the impact of an investment on all the relevant portfolio characteristics or preferences must be evaluated.

2. The broader opportunity set includes mid- and small-cap US stocks, international stocks, multi-sector bonds, and private real estate.

3. These are asset-only analyses. Investors with real rather than nominal liabilities may want to consider the liability-hedging characteristics of Commodities and other real assets.

4. The Sharpe ratios are calculated using geometric expected returns.

5. For these calculations we assume the volatility of Hedge Funds is 10%. This represents the volatility of an allocation to a portfolio of Hedge Funds. Not the volatility of a single fund.

6. A risk premium of 2.7% over cash.

7. Our volatility forecasts we use to develop asset allocations are based on the last 25 years of returns of the Bloomberg Commodity Index. Its volatility was 18%. The GSCI Index tends to have more Energy, and is more volatile. For the last 25 years the volatility of the GSCI index was 29%, and it was 35% for the last five.

8. At 18% volatility an arithmetic return of 7.41% is consistent with a geometric (compound) return of 6%. At 25% volatility, it would require an arithmetic return of 8.58% to produce a geometric return of 6%. Alternatively, a 7.41% arithmetic return is consistent with a geometric return of 4.77% at 25% volatility.

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