Dollar allocation ≠ risk allocation

by **Jess Gaspar**, Managing Director, Commonfund

DOES A 70/30 PORTFOLIO HAVE 70 PERCENT OF ITS RISK IN EQUITIES? While this question may appear to channel the old joke "Is the little red schoolhouse red?", the answer is clearly that a 70/30 portfolio does not have 70 percent of its risk in equity. In fact, it has nearly 100 percent of its risk in equity. This first installment of Quant Corner explains why that is the case, and why investors should resist the temptation to move away from a fully diversified portfolio. Technically, the answer boils down to three factors: the differences in volatility between equities and bonds, the low correlation between equities and bonds, and the resulting differences in the correlations of equities and bonds within the total 70/30 portfolio.

Often, when discussing portfolios, we speak in terms of dollar allocations. Seventy percent equities and 30 percent bonds, or 50 percent equities, 15 percent bonds, 15 percent real assets and 20 percent alternatives. These quick characterizations are useful for working through who gets how much money to manage but not for working through who is taking how much of the total portfolio risk. To understand the portfolio risk question, we need to turn to the volatility and correlation of the portfolio's constituents.

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To illustrate the underlying principles, consider the traditional 70/30 benchmark. In the table below are the volatility of total returns since 1997 for the S&P 500 Index, the Barclays U.S. Aggregate Bond Index and a portfolio comprising 70 percent S&P 500 and 30 percent Barclays Aggregate, rebalanced monthly.

In the second row, we see that the S&P 500 has an annualized volatility 4.5x (0.156/0.035) the annualized volatility of the Barclays Aggregate since 1997. This is the first clue: Each dollar allocated to equities has 4.5x as much volatility as each dollar allocated to bonds. On top of that, we are contributing 70 cents to equities for every 30 cents we contribute to bonds. Thus, if we look at the equity and bond pieces in isolation, the equity risk should be 0.156×0.70 relative to the bond risk of 0.035×0.30 for a ratio of 10.5. Equity contributes 10.5x as much risk as fixed income on a stand-alone basis, or 91 percent of total

Total Return Statistics

	S&P 500	Barclays Aggregate	70/30 Portfolio
Annualized return	0.079	0.057	0.075
Annualized volatility	0.156	0.035	0.109

Due to correlations, a 70/30 portfolio's risk concentration in equity is even worse than what equity and bond volatility alone would suggest.

stand-alone risk. Seems extreme, doesn't it? But we are not done yet. Due to correlations, the total portfolio risk concentration in equity is actually worse than what a stand-alone look at equities and bonds would suggest.

Equities are much more highly correlated with the 70/30 portfolio at nearly 100 percent than are bonds at nearly 5 percent. This is because the stand-alone volatility contribution from equities is so large relative to bonds and because equities and bonds are nearly uncorrelated, at -5 percent. The importance of the stand-alone volatility contribution should be apparent from the previous discussion: a pie made of 10.5 parts cherries and one part radishes still tastes reasonably good.

The role of bond correlation merits further discussion. Bonds reflect two different types of risk exposures: credit and duration. Credit risk stems from the risk of downgrade and ultimately default on the bond. Typically, it is positively correlated with equity risk as defaults tend to happen when equities underperform. Duration risk (for "safe" U.S. Treasuries) arises from the potential for interest rates to rise, driving down prices on bond portfolios. As rates typically fall in Treasuries when equities underperform, duration and equity risks tend to be negatively correlated.[1]

On average over long periods of time, the correlations of credit and duration risks with equity risks roughly offset for the Barclays Aggregate, hence the correlation to the S&P 500 at a level close to zero. Given that most of the risk in the 70/30 portfolio arises from equities due to the relative size of the stand-alone contributions, bonds have a nearly zero correlation with the 70/30 portfolio as well.

Looking at more concentrated duration and credit exposures helps to illustrate the point. A portfolio of 10-year-plus U.S. Treasury bonds, which has substantial duration risk but little credit risk, has exhibited a -18 percent correlation with the 70/30 portfolio. In contrast, a portfolio of high yield bonds, which lies outside the investment-grade universe of the Barclays Aggregate and has significantly more credit risk, has exhibited a +64 percent correlation with the 70/30 portfolio.

1 Note that this need not be true, as in the case of stagflation during the 1970s, but otherwise generally holds true.

70/30

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Correlation with S&P 500	1.000	-0.046	0.995
Correlation with Barclays Aggregate	-0.046	1.000	0.049
Correlation with 70/30 portfolio	0.995	0.049	1.000

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Correlation with Barclays Aggregate	-0.046	1.000	0.049
Correlation with 70/30 portfolio	0.995	0.049	1.000
Contribution to risk of 70/30 portfolio	0.109	0.001	0.109
Percentage contribution to risk of 70/30 portfolio	0.995	0.005	1.000

If we incorporate the high correlation of equities and the low correlation of bonds to the total portfolio with the large standalone contribution of equities and the small standalone contribution of bonds, we obtain the total contribution of equities and bonds to the 70/30 portfolio's total risk. For equities, we have $0.70 \times 0.156 \times 0.995 = 0.109$, while for bonds we have $0.30 \times 0.035 \times 0.049 = 0.001$.[2]

Note that the total for equities equals the total for the 70/30 portfolio out to three significant digits. Indeed, equities contribute north of 99 percent of total portfolio risk to the 70/30 portfolio on a percentage basis. Critically, this dramatically exceeds the 70 percent suggested by looking at the dollar allocation.

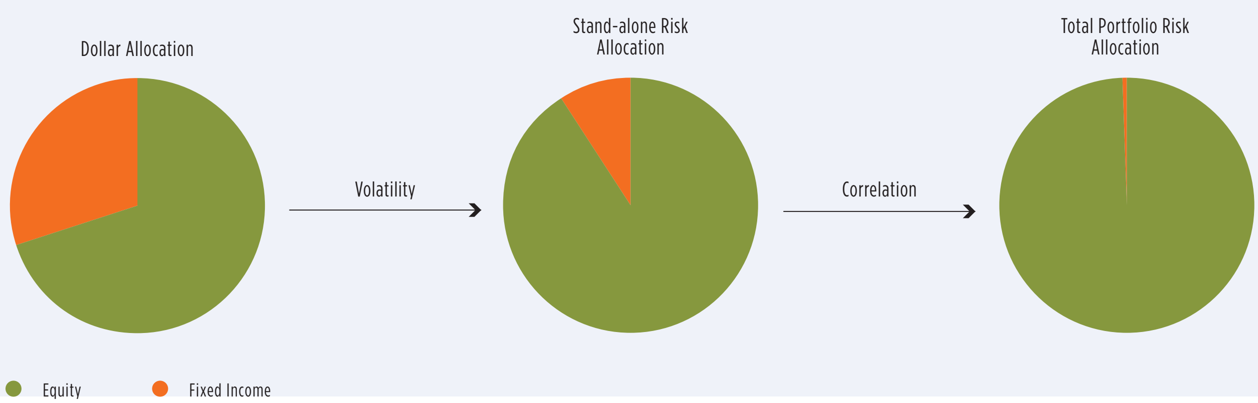
Thus, at Commonfund, one of our primary objectives is to help clients diversify portfolio exposure beyond the nearly pure equity volatility risk embedded in a simple 70/30 equity/fixed income portfolio. Of course, we also strive to increase expected return.

We believe in, and advocate, a fully diversified approach to portfolio construction that includes not only equities and bonds but also alternatives like hedge funds, private capital and real assets. Our objective is to effectively use the multitude of levers at our disposal: investment diversification, manager selection, market timing and, another potential topic for a future Quant Corner, factor investing.

2 In their 2011 Journal of Portfolio Management article, Jose Menchero and Ben Davis coined the phrase the x-sigma-rho model to describe this decomposition. The x stands for portfolio share of an investment, the sigma for investment's volatility and the rho for correlation of the investment with the total portfolio. The product of these three variables gives the percentage contribution to risk for each investment.

Note: This analysis reflects, in part, the impact of the bull market in equities and fixed income since 1997. Thus, results may be period-specific. In particular, historical annualized returns are unlikely to be representative of future returns given current interest rates.

THREE VIEWS OF RISK ALLOCATION IN THE TRADITIONAL 70/30 PORTFOLIO



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