



# When Diversification Fails

Guarding against crisis correlations may require different tools.

August 2019

## KEY INSIGHTS

- The tendency of asset correlations to spike in down markets means that the benefits of diversification can disappear when investors need them most.
- Our own research confirms that correlation profiles in down and up markets have differed significantly across a number of key risky asset classes.
- Investors should avoid using full-sample return distributions in their asset allocation models and may want to consider additional risk management strategies.

Investors are often surprised to discover that the benefits of portfolio diversification can disappear right when they need them most—during down markets, especially during market panics, such as the 2008 global financial crisis.

Previous research has shown this effect to be pervasive for a wide variety of financial assets, including both individual stocks and equity sectors, currencies, bond markets, and hedge fund styles. Not only have correlations among these assets tended to rise on the downside, they also have significantly declined on the upside.

We believe that many investors still do not fully appreciate the impact of asymmetric correlations on portfolio efficiency. During “left-tail” (i.e., extremely negative) market events, diversified portfolios actually may have *greater* exposure to loss than more concentrated portfolios.

In a recent study, we expanded on previous analyses in several ways.<sup>1</sup> We included post-2008 data, covered a broader set of markets, and took an in-depth look at what drives correlations in numerous markets. We introduced a data-augmentation technique to improve the robustness of tail correlation estimates and analyzed the impact of return data frequency on private asset correlations.

## The Failure of Diversification in Risky Assets

Based on monthly data from January 1970 to June 2017, we calculated conditional correlations between U.S. and non-U.S. stocks as measured by the MSCI USA index and the MSCI EAFE index, respectively. These conditional correlation profiles differed substantially from their normally distributed counterparts. When U.S.



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<sup>1</sup> Sébastien Page and Robert A. Panariello (2018) When Diversification Fails, *Financial Analysts Journal*, 74:3, 19-32, DOI: 10.2469/faj.v74.n3.3. See the paper for full methodology, credited references, and the data-augmentation methodology.

# +87%

The correlation between U.S. stocks and non-U.S. stocks rose to +87% during the worst 1% sell-offs.

stocks were rallying (in their 99th percentile), their correlation with non-U.S. stocks dropped to -17%. During the worst 1% sell-offs in U.S. stocks, however, their correlation with non-U.S. stocks rose to +87%. International diversification only worked on the upside.

We found similar results across other risky assets. Figure 1 provides a comparison of left-tail and right-tail correlations for key asset classes. Note that we used bond returns net of duration-matched U.S. Treasuries to isolate credit risk factors. We also show results for equity style and size categories. Diversification failed across styles, sizes, geographies, and alternative assets. Essentially, all the return-seeking building blocks that asset allocators typically use for portfolio construction were affected.

Beyond traditional asset classes, investors have increasingly looked to alternatives for new or specialized sources of diversification. For Figure 1, we used a broad hedge fund index, but one could argue that hedge fund styles are so different from each other that they should

be treated as separate asset classes. Unfortunately, several of the studied styles, including the market-neutral funds, exhibited significantly higher left-tail than right-tail correlations.

As a caveat, conditional correlations represent only one way to measure diversification. Conditional betas, for example, take into account changes in relative volatilities as well as correlations. We chose to study correlations as they measure diversification directly, and have been used widely in prior studies.

Another caveat is that we did not forecast left-tail events; hence, although we know that correlations are likely to increase if markets sell off, we do not necessarily know when this shift will take place. Equity selloffs are, almost by definition, unexpected.

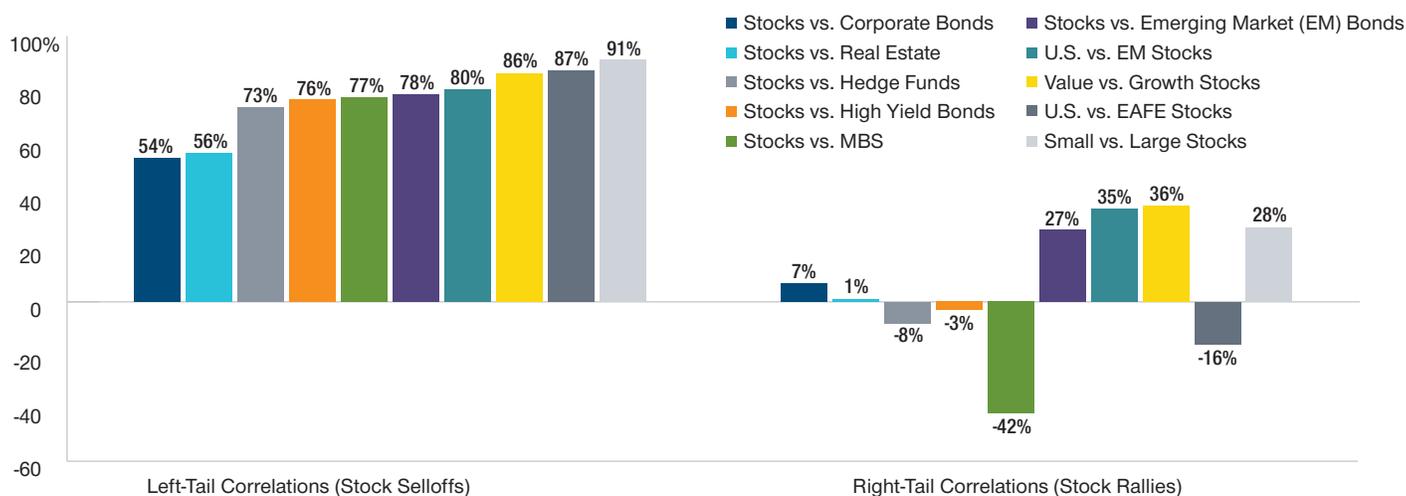
### What About Private Assets?

Although many investors have become skeptical of the diversification benefits of hedge funds, the belief in the benefits of direct real estate and private-equity diversification has been persistent.

## (Fig. 1) Left-Tail vs. Right-Tail Correlations for Key Risky Asset Classes

Diversification has failed in down markets across asset classes<sup>1</sup>

January 1970 Through June 2017



<sup>1</sup> Monthly data. Data sources and start dates based on data availability are detailed at end of this research brief. Left tail and right tail correlations are at the 1st and 99th percentiles, but were adjusted by the data-augmentation methodology. Full correlation profiles (adjusted, unadjusted, and normal) are shown in the full paper's referenced appendix B.

Sources: MSCI, Russell, Bloomberg Index Services Limited, NAREIT, and HFRI (see Additional Disclosures); all data analysis by T. Rowe Price.

Consultants have used mean-variance optimization in asset allocation or asset/liability studies to make a strong case for increased allocations.

Most investors know, however, that there is more to these statistics than meets the eye. Private assets' reported returns suffer from the smoothing bias. Rolling annual correlations are less sensitive to the smoothing bias than those calculated on quarterly returns. On a marked-to-market basis, then, these asset classes are exposed to many of the same factors that drive stock and bond returns.

Not only is the true equity risk exposure of private assets higher than is implied by their reported returns, on average, but their left-tail exposures are much higher. Also, academic studies have shown that private assets have exposure to credit risk, which does not truly diversify equity risk in times of market stress. Moreover, liquidity risk contributes to the asymmetry of private asset returns even more than to the asymmetry of hedge fund returns.

### **Implications for Asset Allocation**

We believe that investors should avoid the use of full-sample correlations

in portfolio construction—or, at least, that they stress-test their correlation assumptions. Scenario analysis, either historical or forward-looking, should take a bigger role in asset allocation than it does.

In addition, significant emphasis should be put on the stock/bond correlation and consideration of whether it will continue to be negative in the future. Shocks to interest rates or inflation can turn this correlation positive.

Finally, we believe investors should look beyond diversification to manage portfolio risk. Tail-risk hedging (with equity put options or proxies), risk factors that embed short positions or defensive momentum strategies, and dynamic risk-based strategies all may provide better left-tail protection than traditional diversification.

Our study does not argue against diversification across traditional asset classes, but investors should be aware that traditional measures of diversification may underestimate exposure to loss in times of stress. In our view, investors should calibrate their risk tolerance (against return opportunities) accordingly.

### **Data Sources**

The conditional correlations shown in Figure 1 were based on the following asset classes, indexes, and data series start dates. U.S. Stocks/Large Stocks: MSCI USA Index, January 1970; Developed Markets Stocks: MSCI EAFE Index (Local), January 1970; Emerging Markets Stocks: MSCI Emerging Markets Index (Local), January 1988; Growth Stocks<sup>1</sup>: Russell 1000 Growth Index, February 1978; Small Stocks: Russell 2000 Index, February 1978; Corporate Bonds: Bloomberg Barclays U.S. Corporate Index, August 1988; Mortgage Backed Securities: Barclays U.S. MBS Index, August 1988; High Yield Bonds: Bloomberg Barclays U.S. High Yield Index, August 1988; Emerging Market Bonds: Bloomberg Barclays Emerging Markets Bond Index, August 1988; Real Estate: NAREIT All Equity Index, January 1972; Hedge Funds: HFRI Global Hedge Funds Index, January 1988.

<sup>1</sup>Growth Stocks were conditioned against Value Stocks (represented by the Russell 1000 Value Index).

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