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The Myth of Diversification: Risk Factors vs. Asset Classes

– The word “risk” derives from the early Italian *risicare*, which means “to dare.” In this sense, risk is a choice rather than a fate.

– Peter L. Bernstein

Diversification often disappears when you need it most.

Consider this: From January 1970 to February 2008, when both the U.S. and world ex-U.S. stock markets – as represented by monthly returns for the Russell 3000 and MSCI World Ex-U.S. indexes, respectively – were up more than one standard deviation above their respective full-sample mean, the correlation between them was –17%. In contrast, when both markets were *down* more than one standard deviation, the correlation between them was +76%. (Standard deviation measures the dispersion of a set of data from its mean.) Should we expect similar asymmetry going forward? As our colleague Richard Clarida noted in a recent essay, we live in a New Normal world in which markets oscillate between two regimes: “risk on” and “risk off.” In such a world diversification across asset classes might work on average, but it might feel like having your head in the oven and your feet in a tub of ice: Even though your average body temperature is OK, your chances of survival are low.

Investors have long recognized that economic conditions frequently undergo regime shifts. The economy typically oscillates between:

- 1) A steady, low volatility state characterized by economic growth; and
- 2) A panic-driven, high volatility state characterized by economic contraction.

Evidence of such regimes has been well documented in market turbulence, inflation and GDP growth. In our New Normal world, regime shifts will continue to cause significant challenges for risk management and portfolio construction.

PIMCO believes asset class returns are driven by common risk factors, and risk factor returns are highly regime-specific. Hence, we believe risk factors – as opposed to asset classes – should be the building blocks for portfolio construction. Risk factors provide a flexible language with which investors may express their forward-looking economic views and diversify their portfolios accordingly.

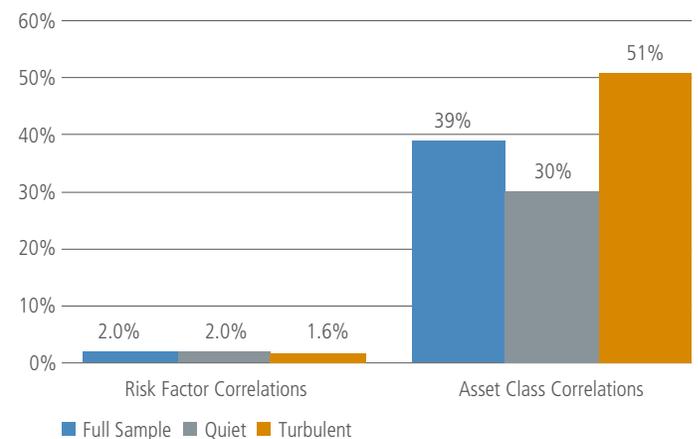
Asset class vs. risk factor diversification

In a recent analysis, we used monthly data from 1994 to 2009 to compare the effectiveness of risk factor diversification vs. asset class diversification. We recognized that in many periods in our sample, there were no significant events that caused prices to change; hence, returns merely reflected the fact that prices were “noisy.” But in other periods, prices shifted in response to significant events. Therefore, we partitioned returns from this analysis into two sub-samples: one associated with our full sample (1994–2009) and the other associated with specific “regimes” of market turbulence during that same period. (“Regime” is risk-management vernacular that connotes periods sharing specific qualities of risk.) To do so, we used a robust mathematical technique called the Mahalanobis distance, which defines market turbulence based on both volatility *and* co-movements. Then we computed standard deviations and correlations for each of the samples based on a threshold calibrated to capture the most turbulent periods: the Asian financial crisis, Russian debt default and long-term capital management flameout of the late 1990s; the dot.com bust, 9/11 and credit crisis early this decade; and the most recent global financial crisis sparked by the subprime mortgage fallout.

As we expected, correlations across risk factors were lower than across asset classes – hence to diversify across risk factors should be more efficient than to diversify across asset classes. Most importantly, our results revealed the average correlation across risk factors did not increase during market turbulence. Figure 1 shows average asset class and risk factor correlations for the full-sample, calm, and turbulent periods. In quiet times, the average asset class correlation was 30%, compared with

51% in turbulent times. In contrast, the average risk factor correlation remained in the 2% range in both our quiet and turbulent times.

FIGURE 1: AVERAGE CROSS-CORRELATIONS (MARCH 1994 – DECEMBER 2009)



Risk factors		Asset classes
Equity	EM spread	U.S. equities (small cap)
Size	Mtge spread	U.S. equities (large cap)
Value	Corp spread	Global equities
Momentum	Swap spread	Emerging market equities
Duration	Real estate	Bonds
2–10 Slope	Commodities	Real estate
10–30 Slope		Commodities

Sources: Barra, Datastream, PIMCO

Hypothetical example for illustrative purposes only.

- Positive (negative) size factor weight implies large (small) cap bias.
- Positive (negative) value factor weight implies value (growth) bias.
- Spread duration factors are measured against Treasuries.
- Base currency is U.S. dollar.
- Selected dates are the dates for which multivariate distance was higher than the tolerance 15% threshold. Source: Windham Portfolio Advisor.
- Asset class regimes were determined using asset class returns, but correspond closely to the risk factor regimes.

- Asset classes: U.S. Equities Small Cap (MSCI US Small Cap 1750); U.S. Equities Large Cap (MSCI U.S. Large Cap 300); Emerging Markets Equities (MSCI EM); Global Equities (MSCI World ex-U.S.); Bonds (BarCap U.S. Aggregate Index); Real Estate (DJ U.S. Select REIT Index); Commodities (S&P GSCI Index). Source: Windham Portfolio Advisor.
- Risk factors: Equity, size, value, momentum, duration, 2-10 slope, 10-30 slope, EM spread, mortgage spread, corp spread, swap spread, real estate, commodity. Sources: all data from Datastream except for size, value, and momentum from Barra.
- The 15% threshold for turbulence can be adjusted to a number greater than 15% to include a broader dataset or lower to focus on more stressed periods. We use 15% to include enough datapoints while still focusing on highly unusual markets.
- This example is not an apple-to-apple comparison since we use average correlations and four of the asset classes are variations of equities, however, it does represent how most investors seek to diversify their portfolios across asset classes and how they typically allocate mandates to external managers.

Extreme correlations and tail risk hedging

Asset class correlations are typically higher than risk factor correlations because most asset classes contain indirect exposure to equity risk. To complicate things, indirect equity risk is like a virus that remains dormant until the body weakens: It tends to manifest itself during extreme market moves. The equity factor exposure is always there, but in normal times investors attribute the returns to real estate or hedge funds or private equity as being the result of good alpha decisions, where in reality they are the result of factor betas like equity; in bad times, they realize they owned equity factor exposure. Investors are often surprised by how seemingly unrelated risky assets and strategies suddenly become highly correlated with equities during a crisis.

Consider the example of the currency carry trade. According to this strategy, the investor sells low-yielding currencies to invest in higher yielding currencies. In normal markets (and on average), this strategy has the potential to be profitable because the high interest rate currencies have not depreciated enough over a given period to offset the gain from the interest rate differential embedded in the currency forwards. But during “risk off” panics, which are generally associated with significant equity downturns, the carry trade can produce devastating losses. Figure 2 shows how the AUD/Equities and JPY/Equities correlations change as a function of equity market returns. It shows that during market downturns, the AUD becomes highly correlated with equities while the JPY becomes

more and more negatively correlated. Because a typical carry trade strategy position would be long AUD and short JPY, this pattern is bad news for an investor with capital invested in both equities and in the carry trade.

FIGURE 2: AUD-EQUITY AND JPY-EQUITY CORRELATIONS AS A FUNCTION OF EQUITY RETURNS



Sources: Equity returns from Barra’s equity factor, AUD and JPY returns from Windham Portfolio Advisor.

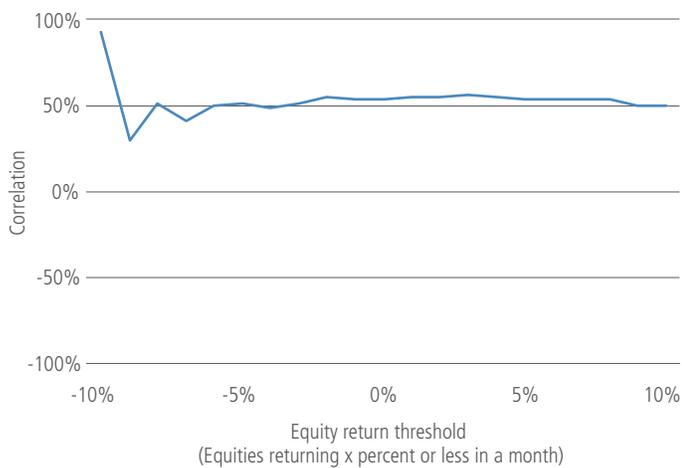
Hypothetical example for illustrative purposes only.

- Using monthly data from March 1994 to December 2009.
- Different time periods will produce different results.

Unforeseen market crises are often referred to as “tail risk events” because of the way they appear on the bell-shaped curves often used to illustrate market outcomes: The most likely outcomes lie at the center of the curve, whereas the unforeseen, less likely events that can wreak havoc on portfolios are plotted at either end – or tail – of the curve. Figure 3 shows a similar pattern in the tail correlation between equities and total returns obtained from being long corporate bond spreads. The Merton (1974) model explains this relationship based on the firm’s capital structure. This model values equity as a call option on the firm’s assets and debt as a “risk-free” rate (all investments contain risk) plus a

short put option, and it can be used to measure embedded equity exposure in corporate bond portfolios. As a firm approaches default, equity shareholders get “wiped out” and bondholders become, essentially, equity holders.

FIGURE 3: CORRELATION BETWEEN CORPORATE BOND SPREADS AND EQUITIES AS A FUNCTION OF EQUITY RETURNS



Source: Equity returns from Barra, other data from Datastream (Barclays U.S. Credit, Barclays U.S. Agg. Gov.)

Hypothetical example for illustrative purposes only.

- Using monthly data from March 1994 to December 2009.
- Different time periods will produce different results.

Overall, our findings reveal that during crises, investors that have not directly diversified their risk factor exposures will find themselves holding two crude asset classes: 1) risk assets and 2) nominally “safe” assets (although all investments carry risk). For tail hedging purposes, these findings can be used to the investor’s advantage. Indeed, proxy hedges such as credit default swap (CDS) tranches and short carry trade positions may be cheaper than equity puts and yet still hedge most of the portfolio’s equity factor risk exposure.

Putting it all together

When they seek to diversify their portfolios, a majority of investors don’t think twice before they average their risk exposures across quiet and turbulent regimes. Consequently, much of the time, investors’ portfolios are suboptimal. For example, during the recent financial crisis, correlations and volatilities across asset classes changed drastically and seemingly diversified portfolios performed poorly.

Here we’ve introduced a regime-specific approach to portfolio construction and risk management. Our results showed that on average, correlations across risk factors are lower than correlations across asset classes, and risk factor correlations tend to be more robust to regime shifts than asset class correlations. Therefore, a risk factor approach to portfolio construction provides a robust platform for investors to express cyclical and secular macroeconomic views and adapt to regime shifts. Moreover, to view the world in risk factor space may also help investors better understand tail risk and find opportunities for cheap proxy hedging.

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