Correlation and Asset Management

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What Return Correlations Do Asset Managers Care About?

Institutional Investors

Asset owners' most important function is allocating capital across asset classes, seeking best risk-adjusted return within a risk budget

They seek diversification asset classes and across geographies

Active Managers

Active management within an asset class seeks to add value versus a benchmark portfolio of the same asset class

Leveraged Fund Managers

Hedged portfolios rely on offsetting return characteristics of long/short positions, the persistence of which maintains risk control

For leveraged, unhedged portfolios, maintaining risk control may have greater dependency on asset volatility than correlation

Institutional Asset Allocations Have Evolved, but Slowly
The Allocation to Riskier Assets Has Generally Increased

U.S. Public Pension Asset Allocation

Callan Associates Public Pension Asset Allocation

Legend: Equity • Alteratives • Fixed Income

Pew Analysis of Financial Accounts of U.S.

Legend: Equity and Alternatives • Fixed Income and Cash
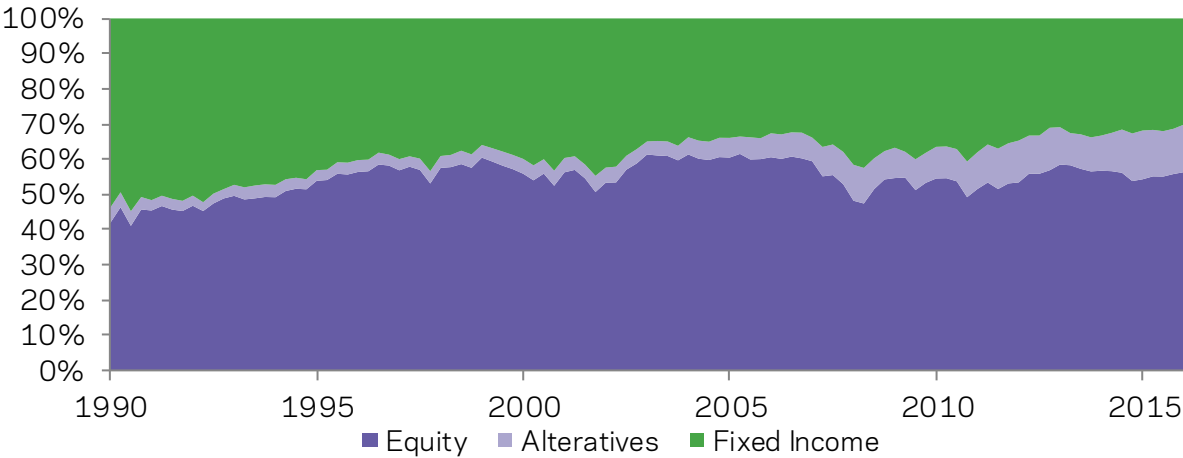
Has the shift to riskier assets been driven by changes in correlation?

Lower Asset Class Correlations Didn't Motivate the Shift to Stocks
Regulations, Demographics, and Markets May Be More Likely Drivers

U.S. Public Pension Asset Allocation
Callan Associates Public Pension Asset Allocation

Legend: Equity · Alternatives · Fixed Income

Pew Analysis of Financial Accounts of U.S.

Legend: Equity and Alternatives · Fixed Income and Cash
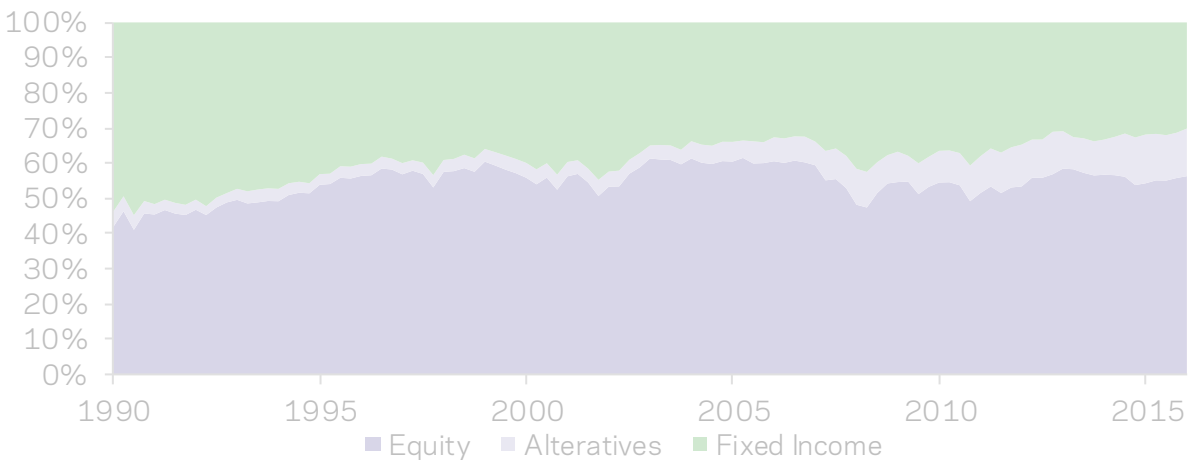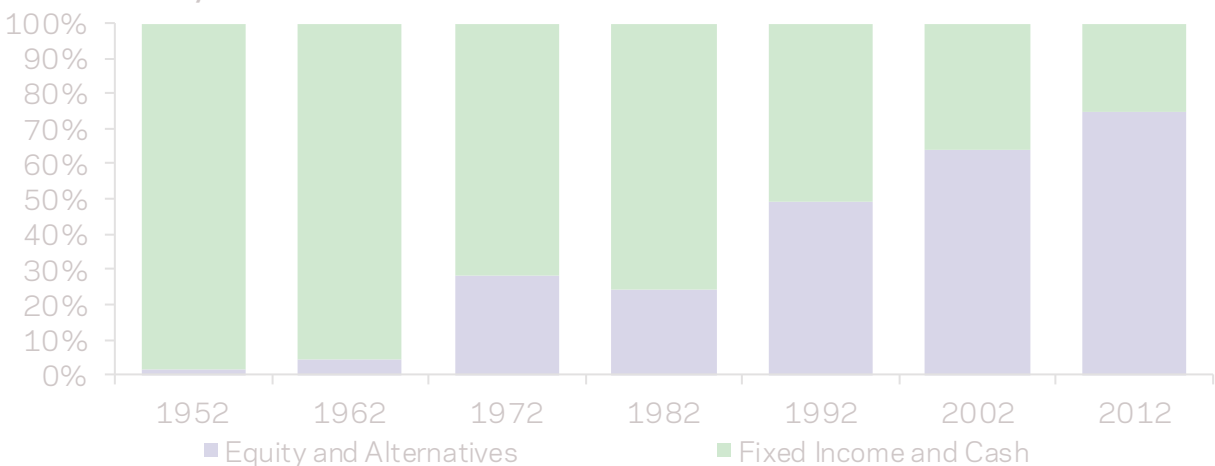
Correlation of Monthly Returns of Stocks/Bonds
Rolling 5-Year Window
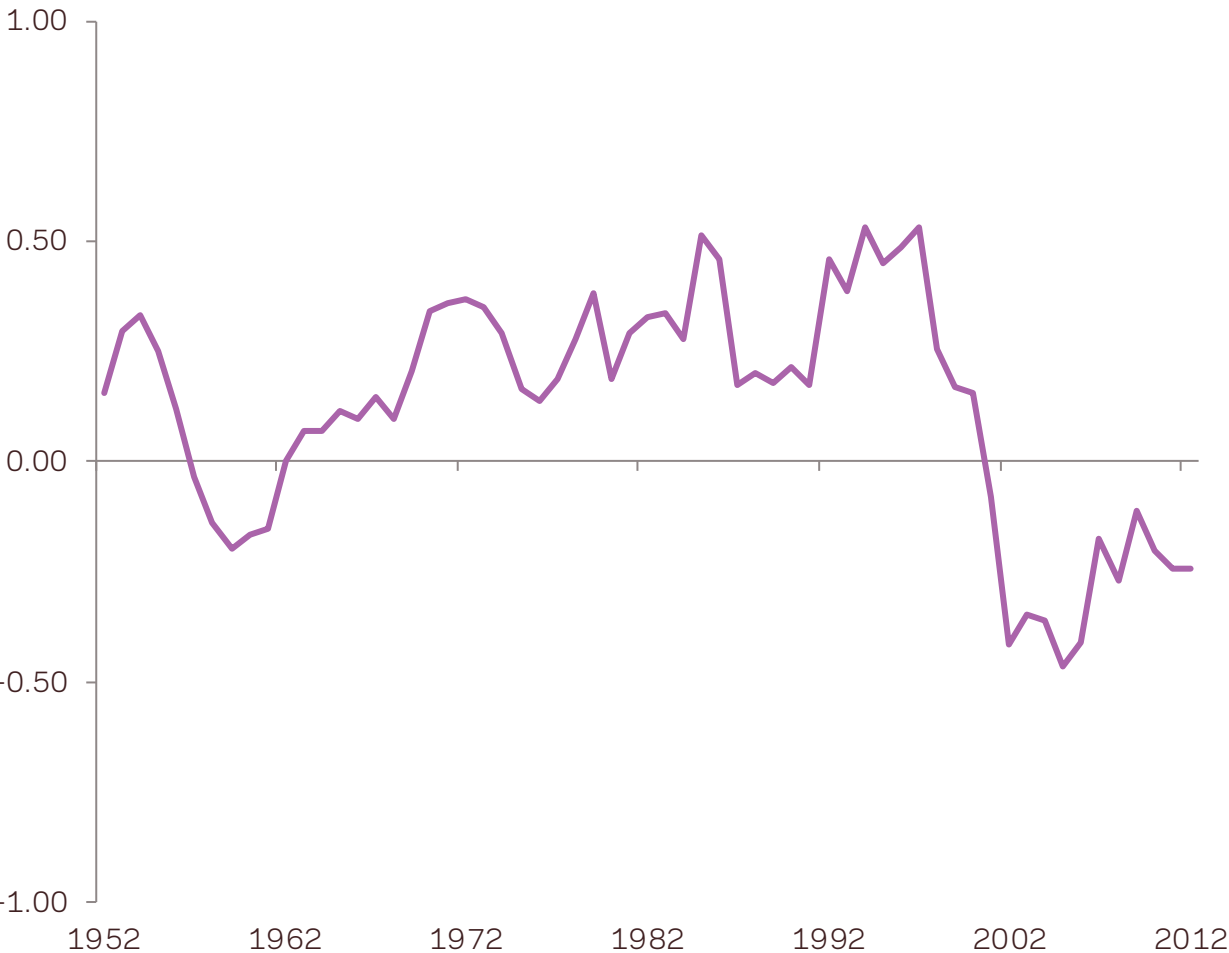
Institutional Investors Have Gone Global in the Last Thirty Years
Broad Globalization of Investment in All Asset Classes

International Allocations of U.S. Public Pensions

% Non-US Stocks and Bonds
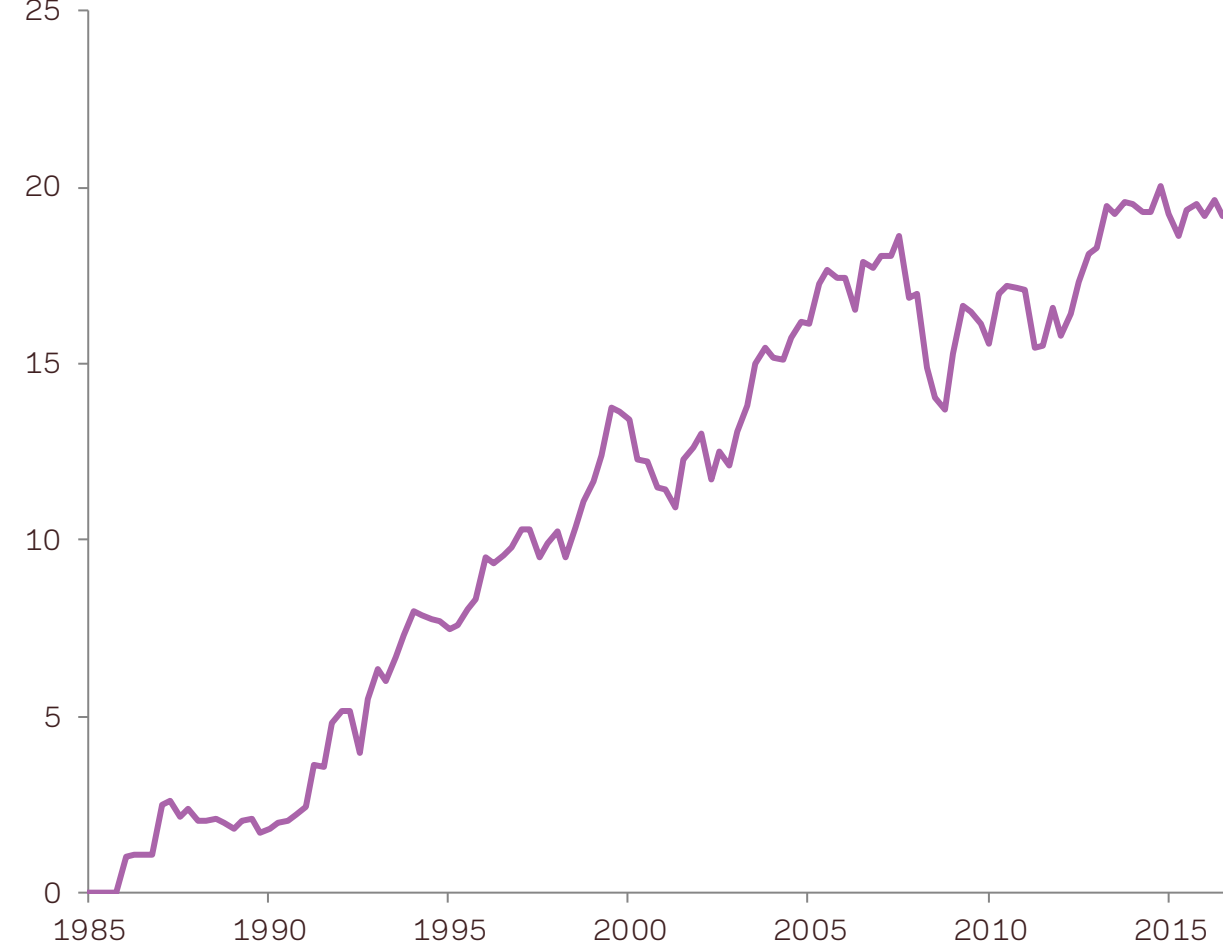
Did changes in the correlation of returns across countries drive this globalization?

Both Correlation and Global Allocation Rose During This Period
Globalization Grew in Spite of a Reduced Diversification Benefit

International Allocations of U.S. Public Pensions
% Non-US Stocks and Bonds
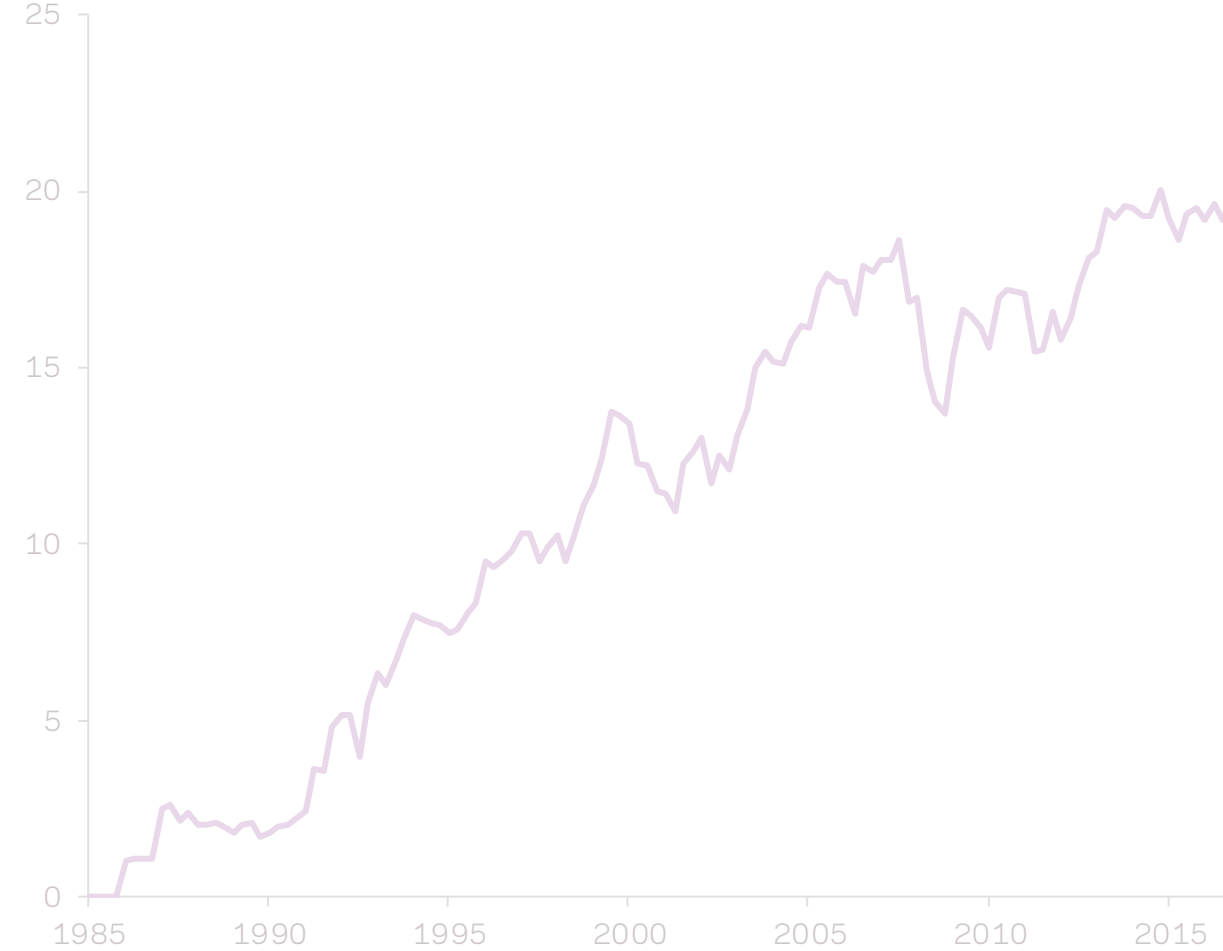
1- Yr Average Correlation of Weekly Returns
Across Developed Stock Markets and Bond Markets
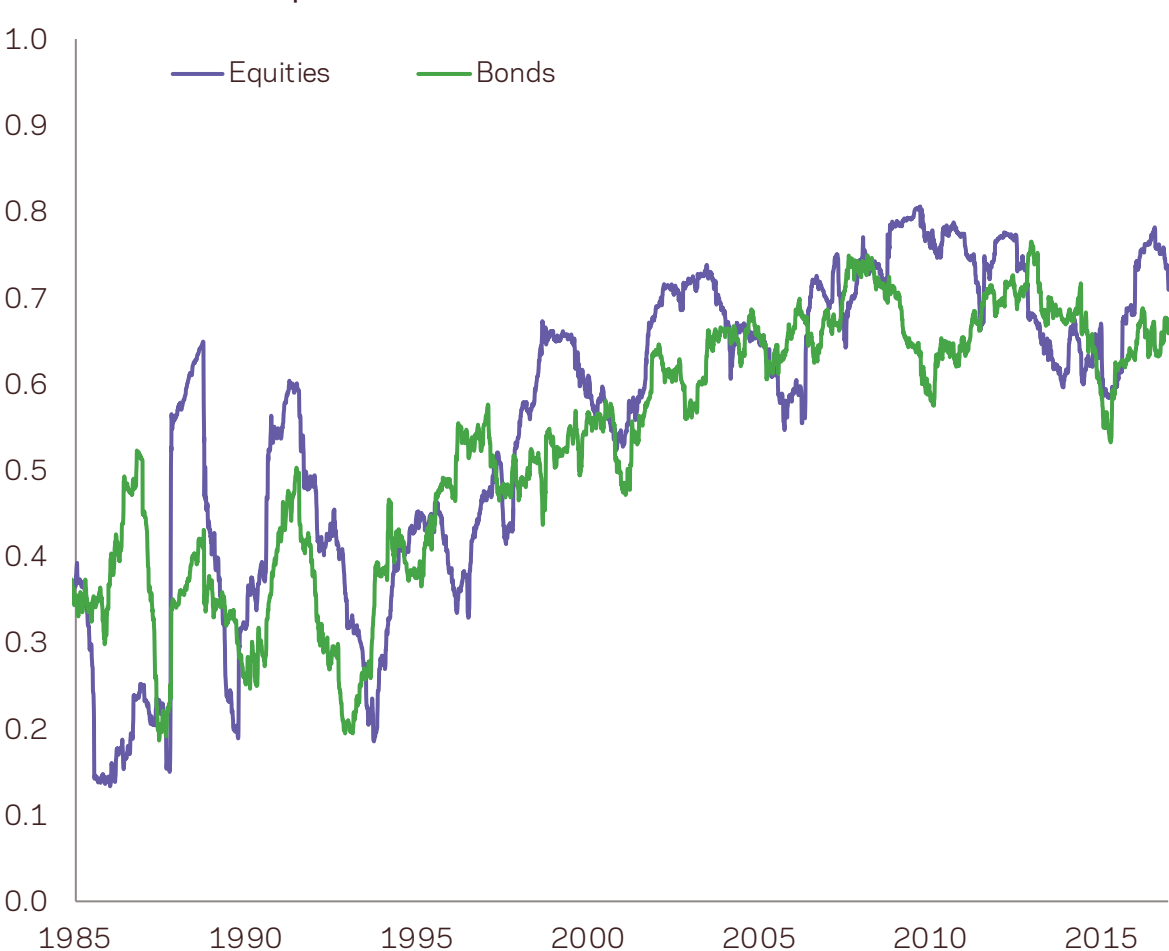
Source: AQR. Callen Associates Public Pension Asset Allocation Data, 1985 to 2016. Global equities 1-year correlations are the primary equity index for 10 developed countries. Global bond 1-year correlations are 10 Year government bonds for 6 developed countries. . Developed equities data includes the broad market-cap weighted indices which are sufficiently liquid to trade in each of the following countries/regions: Australia, Canada, France, Germany, Hong Kong, Italy, Japan, Netherlands, Spain, Switzerland, United Kingdom, United States, and continental Europe. Developed bonds data includes GDP-weighted government bonds from the following countries: Australia, Canada, Germany, Japan, United Kingdom, United States. Please read important disclosures in the Appendix.

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Active Equity Managers Too Often Fail to Outperform Benchmarks
Dispersion of Returns Represents the Opportunity for Performance

Cross Sectional Dispersion of Returns
Russell 1000 Stocks
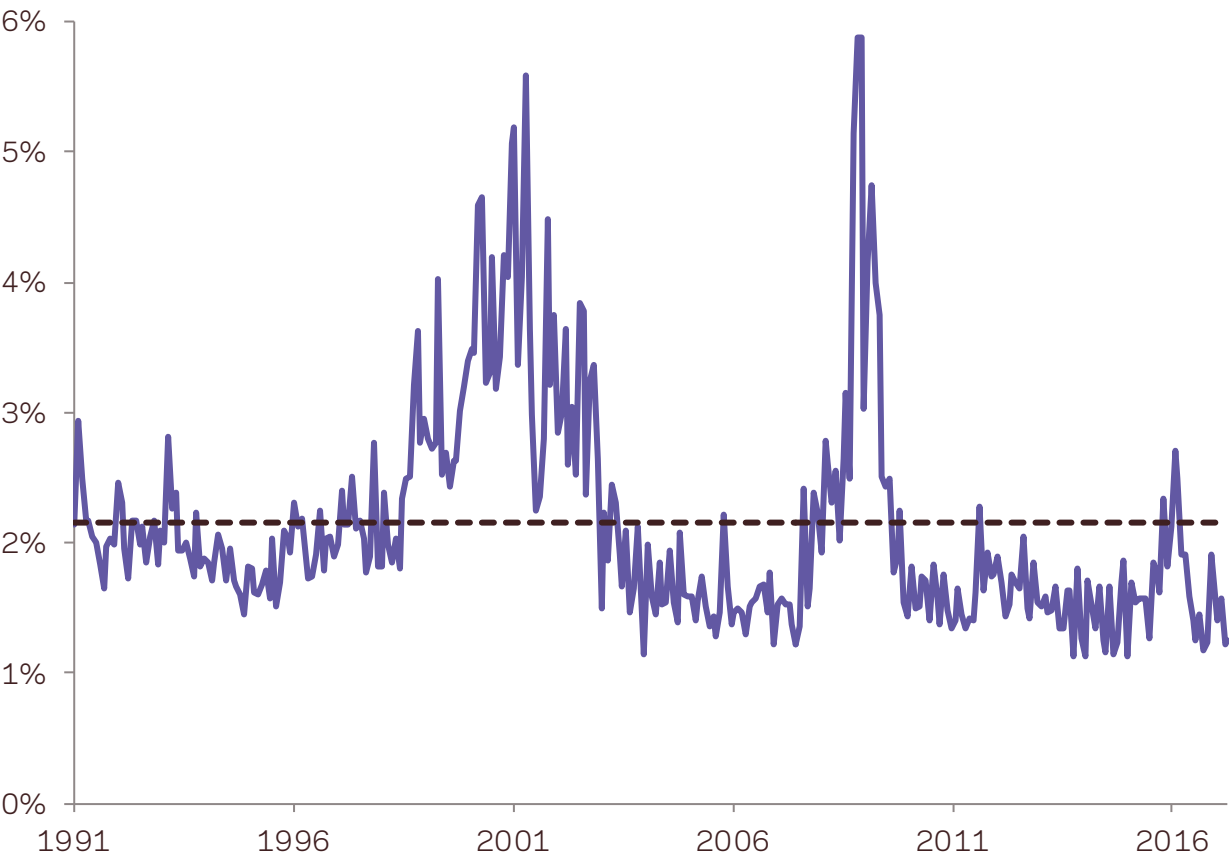
Average Pairwise Correlation of Daily Returns
Russell 1000 Stocks, Rolling 1-Year

Active Equity Managers Too Often Fail to Outperform Benchmarks
Low Market Volatility Creates Low Dispersion and Less Opportunity

Cross Sectional Dispersion of Returns
Russell 1000 Stocks
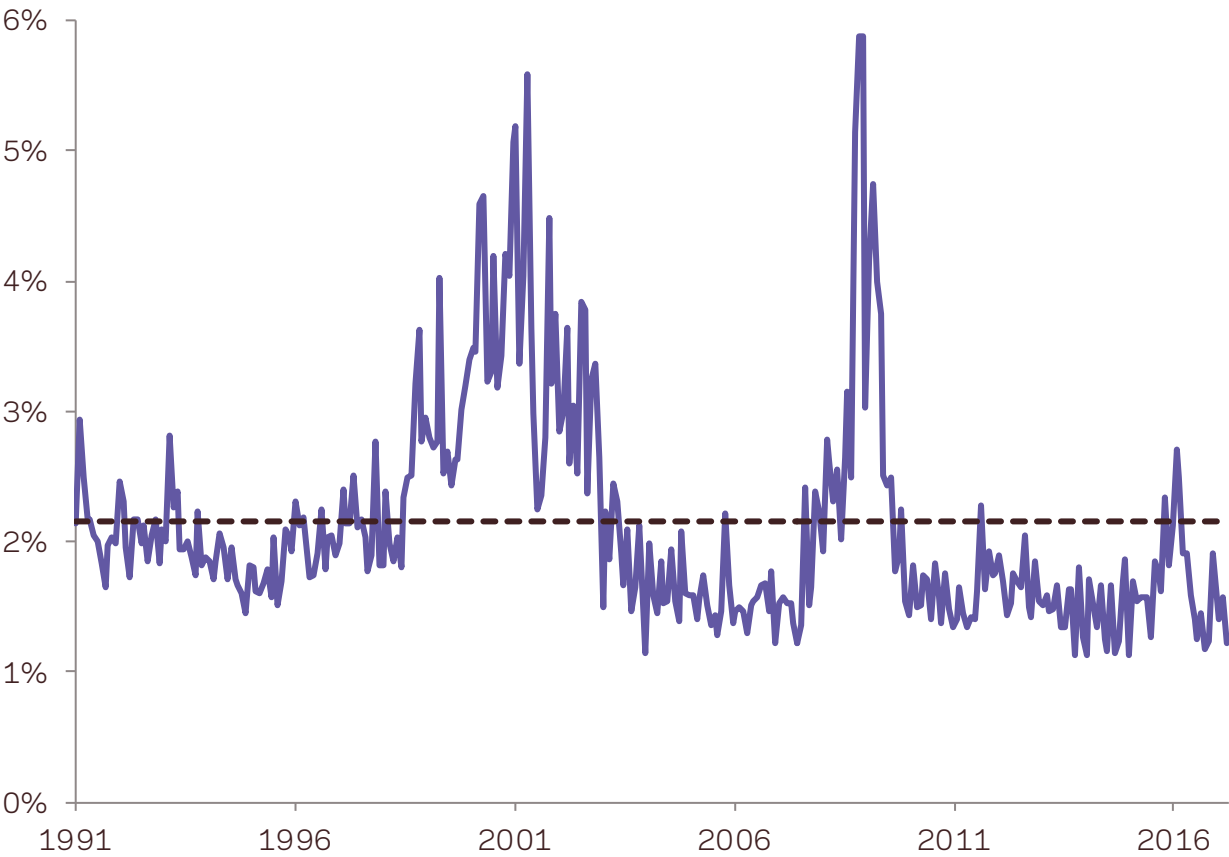
1-Year Realized Volatility of Weekly Returns
Russell 1000 Stocks

The Significance of Correlation Could Be Different for Levered Funds
Long/Short Strategies Depend on Factor Correlation to Control Risk

Cumulative Return of Market Neutral Equity

Hypothetical Strategy from July – August 2007
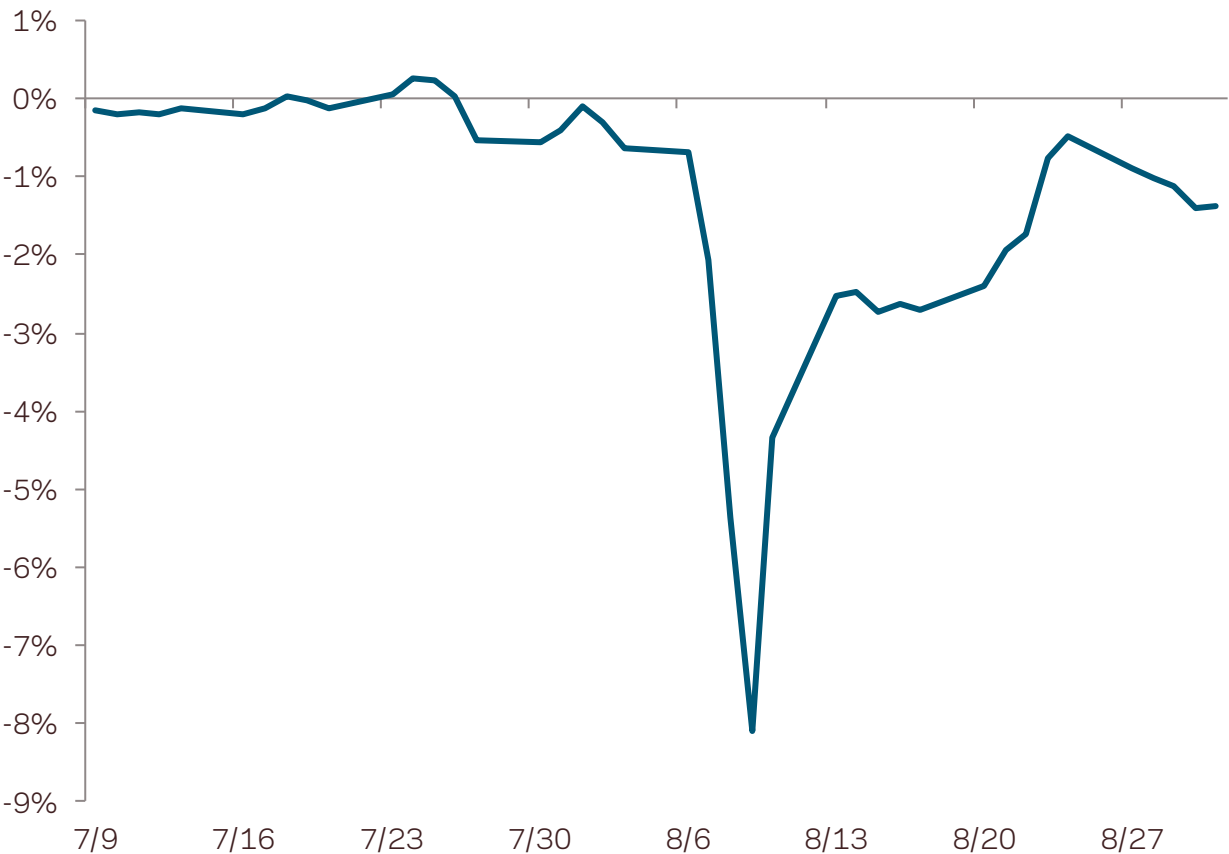
How much of the market neutral equity drawdown was related to sudden changes in expected long/short relationships?

The Relationship Between Long/Short Factors Broke Down
We Can Identify the Cause of the Correlation Change - a Liquidation

Cumulative Return of Market Neutral Equity
Hypothetical Strategy from July – August 2007
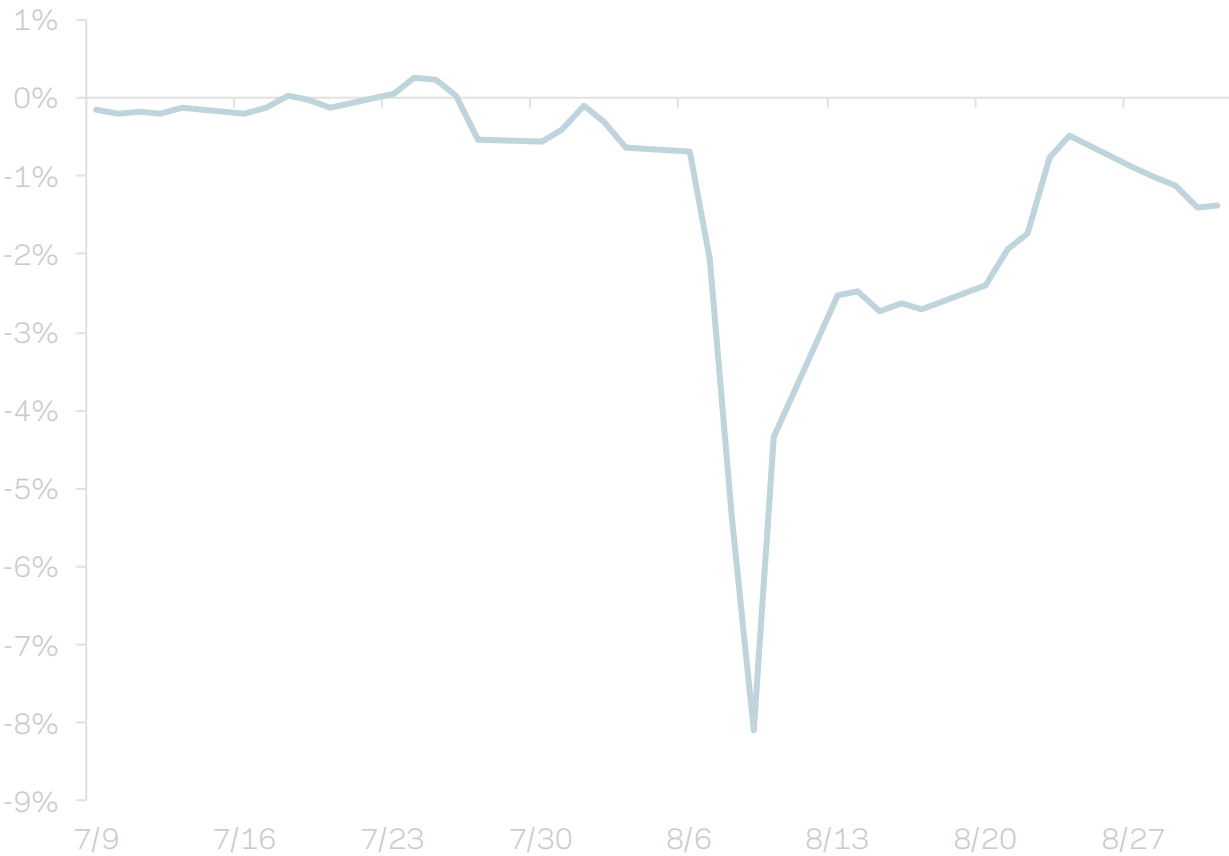
5-Day Correlation of Long and Short Positions
Hypothetical Strategy from July – August 2007
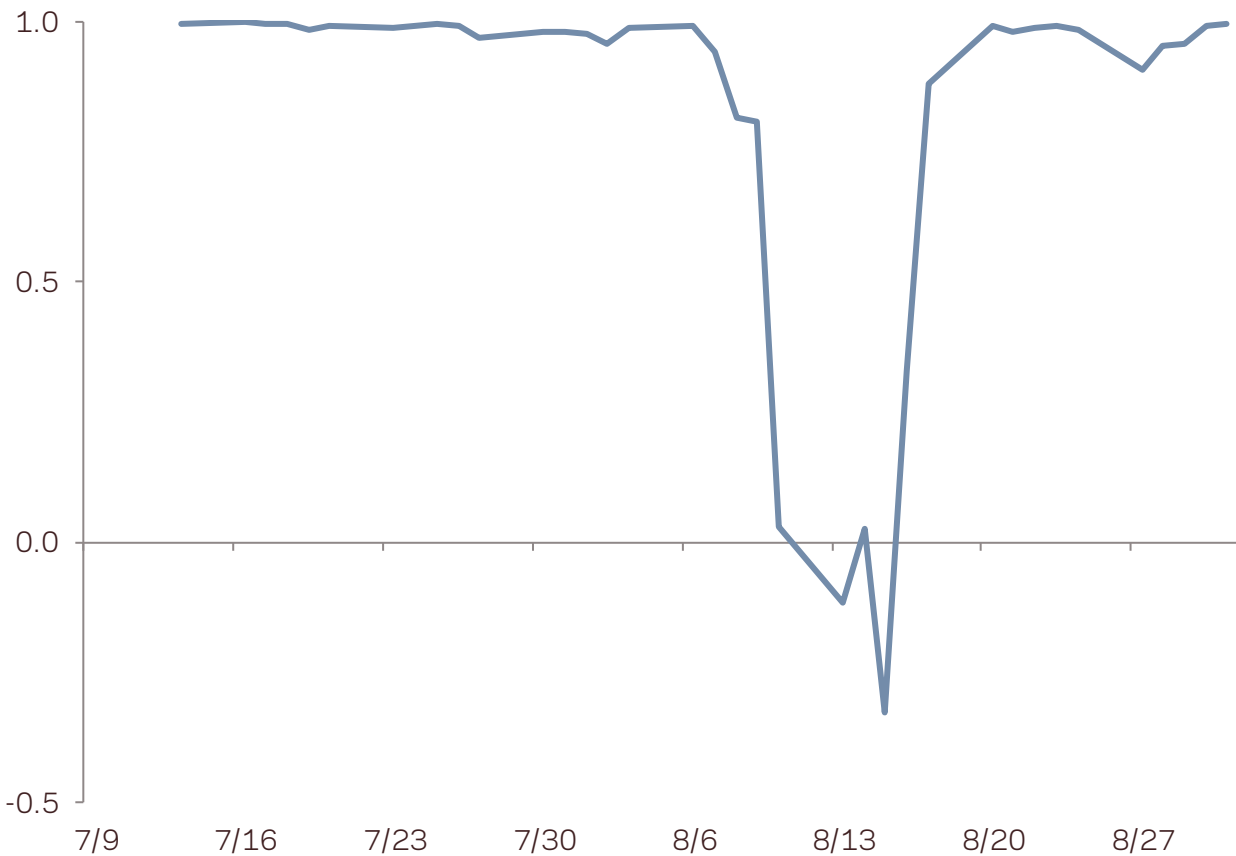
Source: AQR. For illustrative purposes only and not representative of an actual portfolio AQR manages. Cumulative return of an equal weight portfolio based on long and short positions from a hypothetical diversified market neutral equity strategy which incorporates factors like value, momentum, defensive and quality to determine if attractive (long) or unattractive (short) from July 9, 2007. The investment universe includes all U.S. publicly traded stocks of which only a sub-set are included based on total attractiveness of aforementioned factors. The rolling 5-day correlation is between the equal weighted long and short portfolios daily returns. Please read important disclosures in the Appendix. Hypothetical data has certain inherent limitations, some of which are discussed in the Appendix.

Exposures in Risk Parity Are Driven by Volatility and Correlation
Managers May Change Positioning as Covariance Estimates Change

Hypothetical Risk Parity Exposures
Using EWMA Volatility and Correlation Model*

— Stocks — Bonds — Commodities
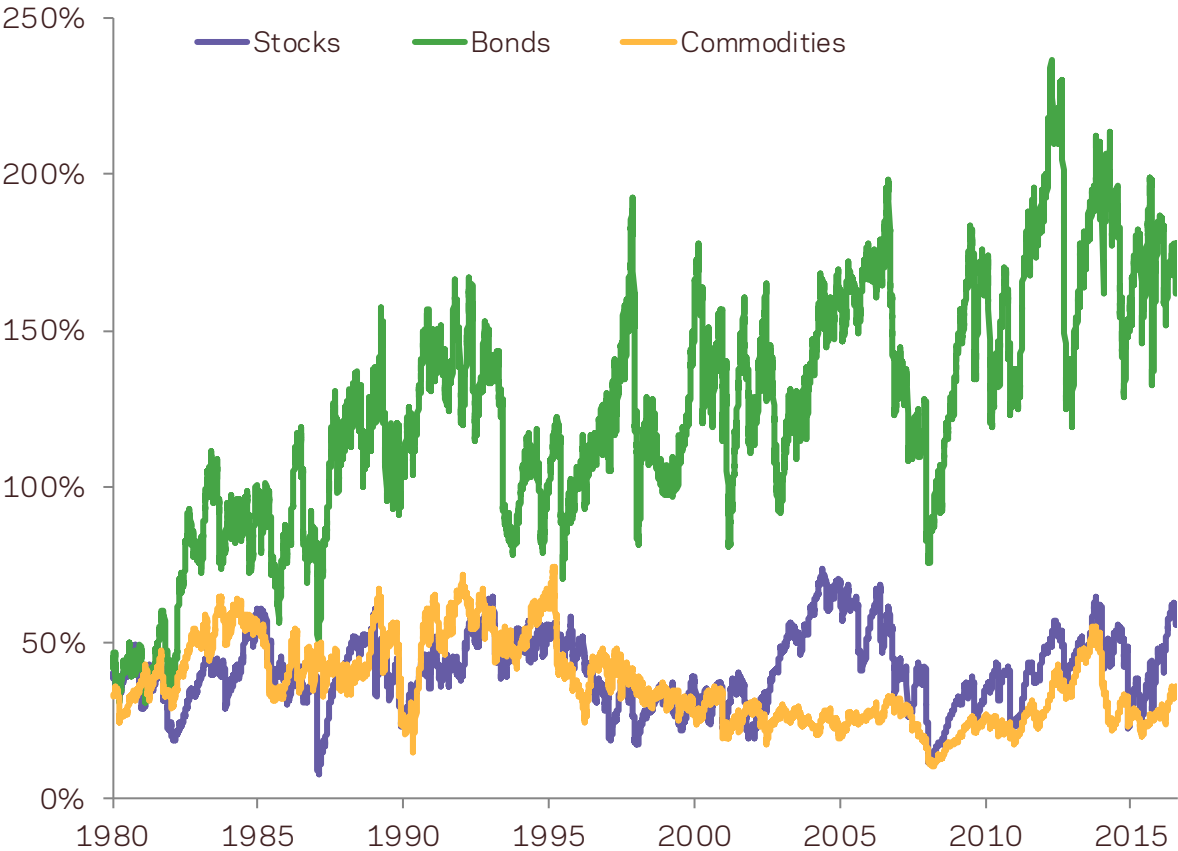
How much do correlation estimates matter in determining risk parity positioning?

Exposures in Risk Parity Are Driven by Volatility and Correlation
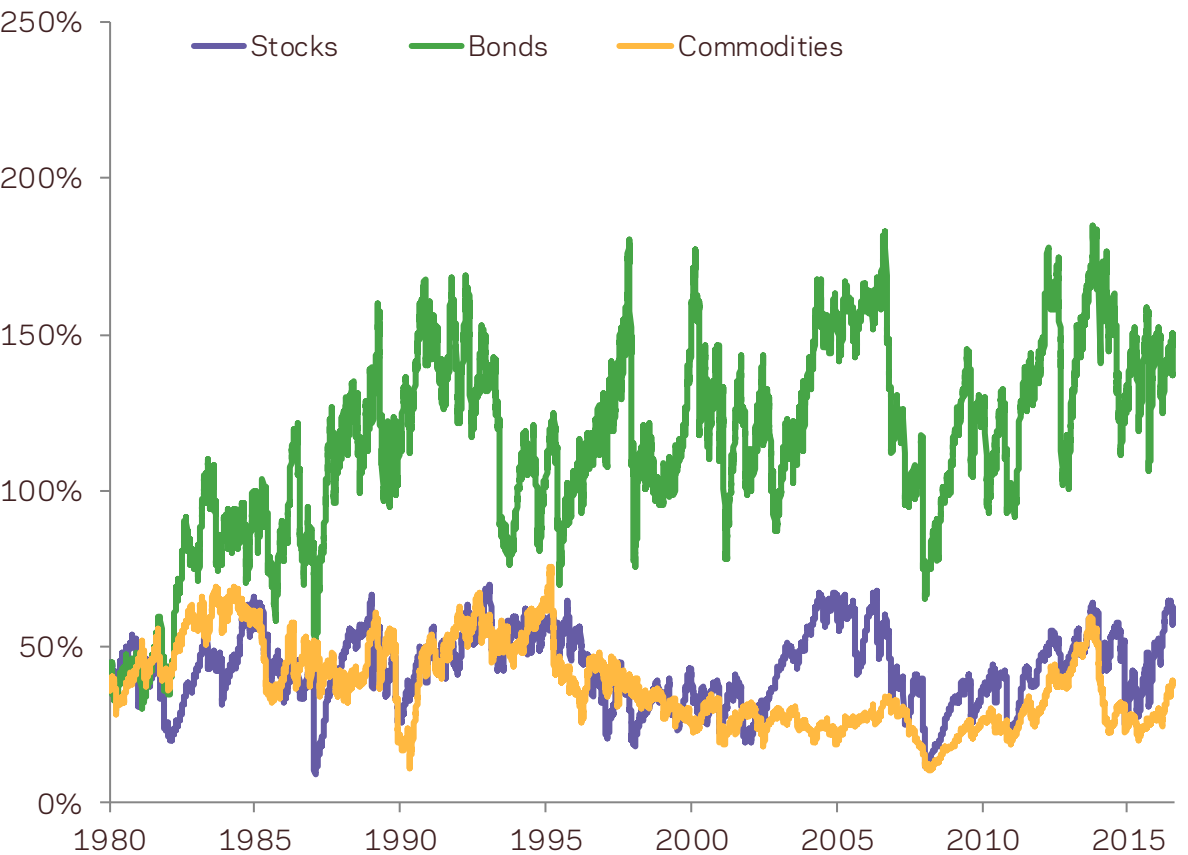## Alternative Correlation Models Don't Strongly Affect Positioning

Hypothetical Risk Parity Exposures
Using EWMA Volatility and Correlation Model
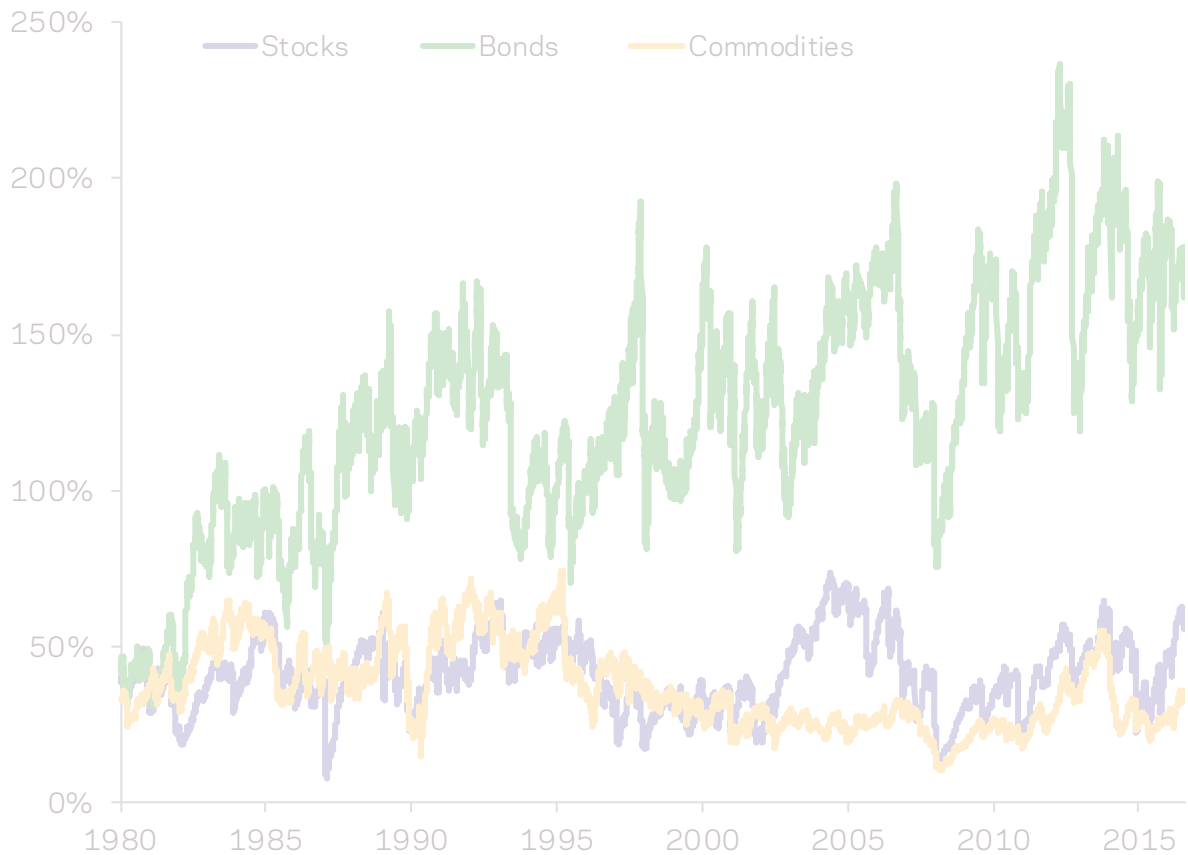
Hypothetical Risk Parity Exposures
Using EWMA Volatility and Constant Correlation Model

Source: AQR. Morgan Markets, Bloomberg, MSCI, Barclays Live, Datastream, Reuters, Markit, Credit Suisse, Citi Velocity. The above exposure examples are based on a hypothetical 3-asset class risk parity strategy, which is not representative of an actual AQR strategy, and are for illustrative purposes only, from 1980 to 2016. The hypothetical asset class exposures shown are calculated using the volatility forecasts and volatility targets of three asset classes (developed equities, developed bonds and commodities). The volatility targets are sized using asset class correlation forecasts such that the risk contribution across asset classes is equal and the hypothetical strategy targets 10% annualized volatility, as asset class volatility forecasts evolve across the different periods, so do the exposures. The methodology used to calculate the asset class volatility and correlation forecasts are commensurate with those used in all AQR risk parity strategies, and the data reflects the historical data represented by the securities for the respective asset classes. Developed equities data includes the broad market-cap weighted indices which are sufficiently liquid to trade in each of the following countries/regions: Australia, Canada, France, Germany, Hong Kong, Italy, Japan, Netherlands, Spain, Switzerland, United Kingdom, United States, and continental Europe. Developed bonds data includes GDP-weighted government bonds from the following countries: Australia, Canada, Germany, Japan, United Kingdom, United States. Commodities data includes individual futures consistent with the weighting and composition of the S&P GSCI Commodity Index. Hypothetical data has certain inherent limitations, some of which are discussed in the Appendix.

Exposures in Risk Parity Are Driven by Volatility and Correlation
Most of the Changes in Positioning Are Explained By Volatility

Hypothetical Risk Parity Exposures
Using EWMA Volatility and Correlation Model

Legend: Stocks — Bonds — Commodities
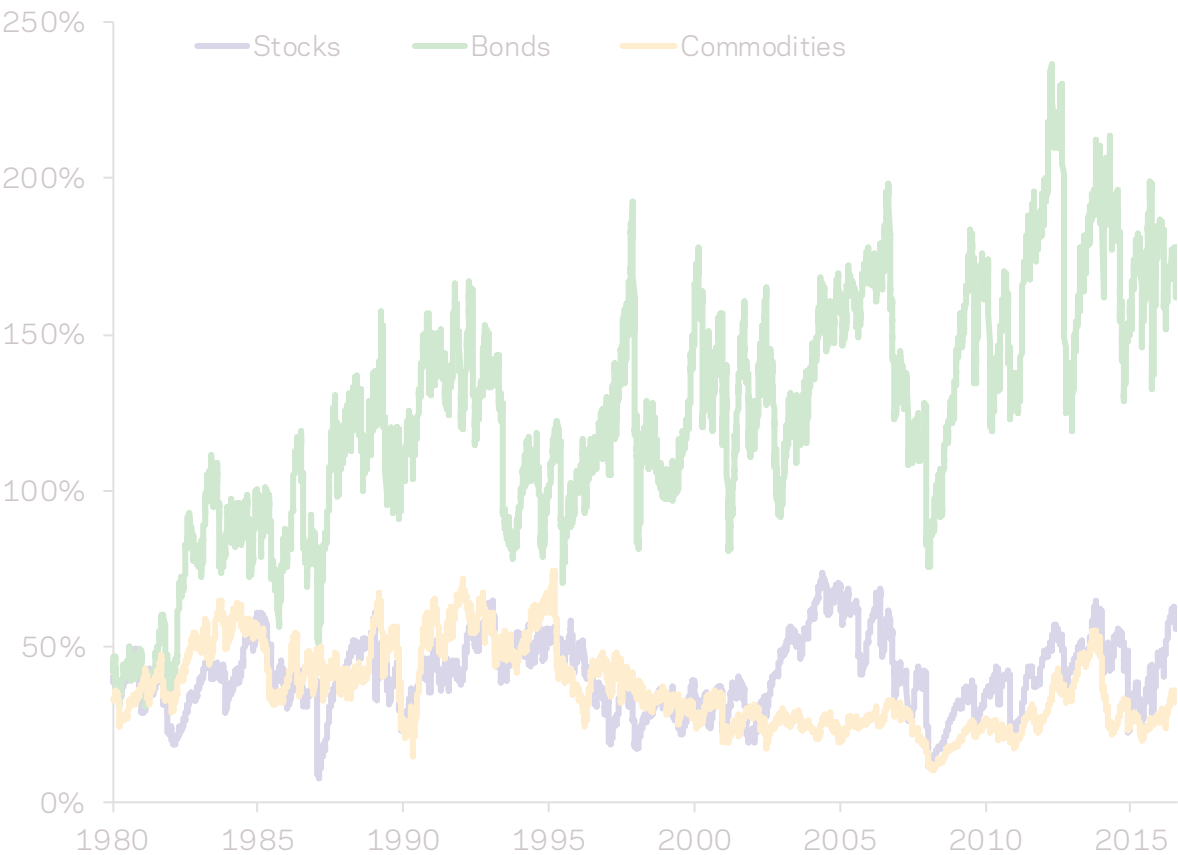
Exposures With Different Correlation Models
Relative Exposures With EWMA and Constant Correlation Models

Legend: Stocks — Bonds — Commodities

Source: AQR. Morgan Markets, Bloomberg, MSCI, Barclays Live, Datastream, Reuters, Markit, Credit Suisse, Citi Velocity. The above exposure examples are based on a hypothetical 3-asset class risk parity strategy, which is not representative of an actual AQR strategy, and are for illustrative purposes only, from 1980 to 2016. The hypothetical asset class exposures shown are calculated using the volatility forecasts and volatility targets of three asset classes (developed equities, developed bonds and commodities). The volatility targets are sized using asset class correlation forecasts such that the risk contribution across asset classes is equal and the hypothetical strategy targets 10% annualized volatility, as asset class volatility forecasts evolve across the different periods, so do the exposures. The methodology used to calculate the asset class volatility and correlation forecasts are commensurate with those used in all AQR risk parity strategies, and the data reflects the historical data represented by the securities for the respective asset classes. Developed equities data includes the broad market-cap weighted indices which are sufficiently liquid to trade in each of the following countries/regions: Australia, Canada, France, Germany, Hong Kong, Italy, Japan, Netherlands, Spain, Switzerland, United Kingdom, United States, and continental Europe. Developed bonds data includes GDP-weighted government bonds from the following countries: Australia, Canada, Germany, Japan, United Kingdom, United States. Commodities data includes individual futures consistent with the weighting and composition of the S&P GSCI Commodity Index. Hypothetical data has certain inherent limitations, some of which are discussed in the Appendix.

Summary: How Does Changing Correlation Affect Investment?

Institutional Investors

Asset allocation has meaningfully evolved but doesn't seem to have been based on correlation changes

Globalization of allocations grew in spite of increasing correlations; the benefits were still substantial and underutilized

Active Managers

The dispersion of returns is lower, but it's not because of abnormally high correlation. Lower market volatility may make it more difficult to outperform, post transaction costs

Levered Fund Managers

Long/short portfolios have more critical dependency on the realization of correlations within a tolerable range

For leveraged, but unhedged portfolios, the relative importance of volatility and correlation may be more tilted toward volatility

Appendices

Disclosures