



QIS Insights

Alternative Risk Premia in a Rising Yield Environment

- The end of the three-decade long rally in bonds has been called many times over the past generation. Trumponomics and its emphasis on tax cuts and infrastructure spending have jolted markets into a reflationary mindset and put the question of a bond bear market back at the forefront of investors' minds.
- We study the potential impact of rising yields on well-established alternative risk premia across asset classes, highlight the likely beneficiaries such as equity value factor, merger-arbitrage and credit carry, and provide insights into the link between yield environments and these risk premia strategies. Conversely, among factors likely to underperform during rising yield periods, we identify low volatility, whose negative interest rate sensitivity is widely covered in the literature, but also emphasize similar properties for factors such as quality.
- With regards to alternative risk premia in the rates space, there is an ongoing concern among investors that such strategies might be strongly biased towards generating positive excess returns during rates rally environments. This is a very legitimate concern as most of these rates risk premia strategies have not experienced over their backtest or live periods any bond bear market lasting multiple years. Given the importance of this question, we dedicate a full section to it and go into details on the likely impact of rising yields on such strategies with a focus on the most popular rates factor namely carry.
- As, in practice, the sensitivity of alternative risk premia strategies to rising-and-falling yield environments cannot be considered in isolation from other exposures an investor may have in his overall portfolio, we provide a brief refresher on the relationship between equities and treasury yields, in other words the correlation between equities and bonds throughout the economic cycle.

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Studying the impact of rising yields is a challenging task. The last secular bond bear market indeed took place between 1954 and 1981 when 10y Treasury yields¹ moved up to over 15.8% from a low of 2.4%. Nevertheless, since the 1980s, treasury markets saw a number of shorter-lived albeit sustained rising-yield episodes which can be considered as bond bear markets. Among recent rising-yield episodes, a few were prominent enough and lasted long enough to spark investors' jitters and raise concerns about a long-term bear market:

- *"Taper Tantrum"* (May - Dec 2013): on May 22, 2013, the Fed announced that it would begin reducing its \$85 billion of monthly bond and mortgage backed securities purchases. This led to a surge in US Treasury yields¹ from a low of 1.66% in May 2013 to a high of 3.04% late December.
- *"Trump Reflation Rally"* (Jul - Dec 2016): Over the second half of 2016, Treasury yields were on a steady upward trajectory from record lows reached early July 2016 of just under 1.4%. On the day Donald Trump was announced as the president-elect, US 10y Treasury yields¹ spiked from 1.88% to 2.07%, reflecting a rapid re-pricing of inflation risks, before edging up in the subsequent weeks to reach a high of 2.60% mid December.
- *"Quantitative Easing 1"* (Jan 2009 - Mar 2010): While the weeks following the announcement of QE1 in November 2008 saw a very sharp rally in Treasury yields, with US 10y Treasury yield almost halving, the subsequent months until the end of QE1 in March 2010 actually saw a reversal with yields retracing to levels pre-quantitative easing. It is often assumed that QE, by bidding up the price of treasury bonds, lowers their yields. However, the facts contradict this assumption, as US treasury yields and long-term rates have increased during the Fed's three iterations of QE and have decreased in interim periods in which QE was absent. Explanations for these "contrarian" results range from the market interpreting QEs as inflationary to investors steering the Fed's newly released liquidity into riskier asset, such as equities, and reducing their holdings in safe-haven Treasuries.

In the subsequent section, we analyse the behaviour of well-established alternative risk premia strategies during rising yield environments. Each of these alternative risk premia is captured using a Barclays tradable index exhibiting the following characteristics:

- Simple and transparent in their construction
- Clarity and robustness of risk premium capture: in other words, distributions of returns and their properties (in particular skew) are fairly stable. For instance, an FX carry strategy remains "long carry" (negatively skewed) and cannot be switching to a "short carry" profile (positively skewed)

RISK PREMIUM	STRATEGY	TICKER	CONSTRUCTION / RATIONALE
Carry	FX Carry	BFXSW5UE	Seeks to generate excess returns by going long high-yielding versus short low-yielding assets from a pool of similar assets/instruments
	Rates Carry	BXIIIFCU	
	Credit Carry	BCRIHGBA	
	Commodity Carry	BCCFBA3P	
Momentum	Equity Momentum	- ²	Takes positions in instruments based on past price patterns, momentum being cross sectional (long past winners and short past losers), while trend is time-series based hence takes long / short directional positions on individual assets
	Cross-Asset Trend Following	BXIIXTAP	

¹ Determined using the US 10Y Constant Maturity Treasury Rate: H15T10Y Index on Bloomberg

² Equity Momentum, Equity Value, Equity Low Volatility and Equity Quality are equally weighted combinations of relevant Barclays Equity Factor Market Hedged Indices across US, Eurozone, UK and Japan

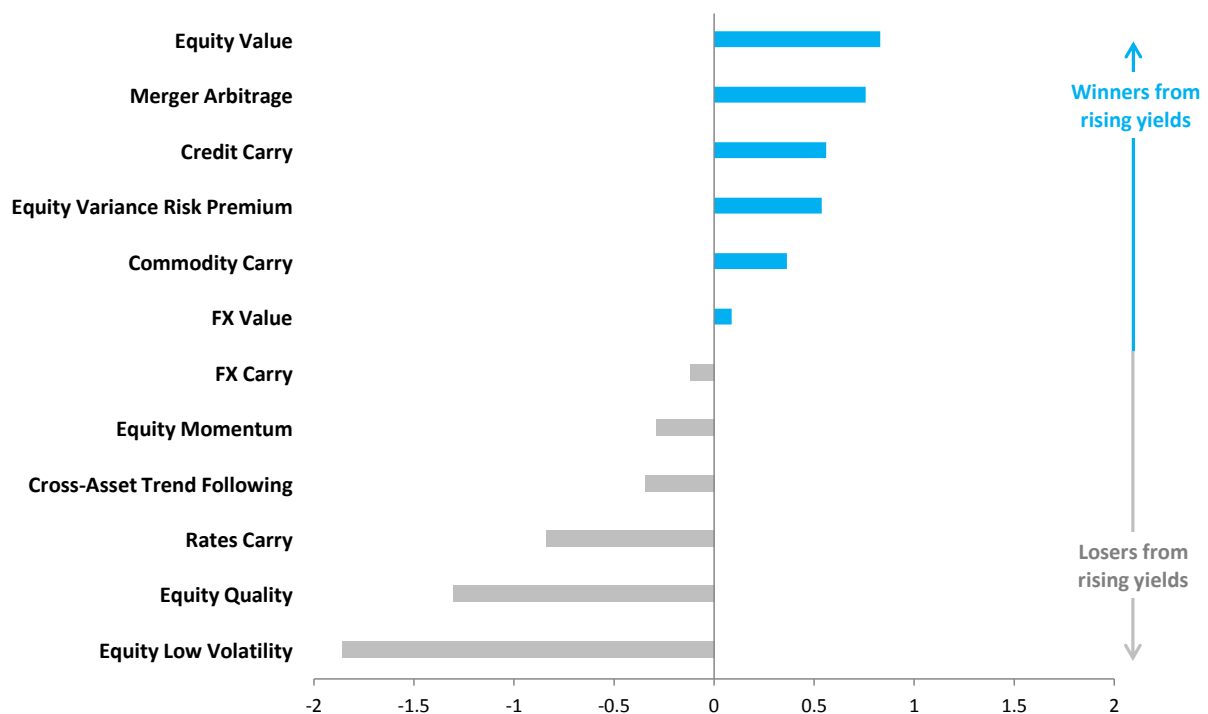
2 This is not a product of Barclays Research. This is a product of Barclays Sales and Trading. For Professional and Institutional Investors Only. Not for Retail Distribution. Investors in specific Asia Pacific countries should review important disclosures at the end of this document.

Value	Equity Value	- ²	Seeks to generate excess returns by selecting relatively undervalued assets and shorting relatively overvalued assets
	FX Value	BXIIIVEUS	
Volatility	Equity Variance Risk Premium	BXIIISVUE	Seek to earn the premium available between implied volatility and realised volatility in options markets, by taking on the risk of spikes in realised volatility
Other	Equity Low Volatility	- ²	Captures excess returns from stocks with lower-than-average volatility
	Equity Quality	- ²	Captures excess returns from stocks that have low debt, stable earnings growth and other quality metrics
	Merger Arbitrage	- ³	Aims to capture the premium between target share price and the deal consideration for merger deals

Winners and losers from rising yields

For each risk premia strategy listed above, we compute the Sharpe ratio conditional on the yield environment, where rising and falling yield environments are determined using quarterly changes in US 10y generic government bond yields over the 11-year period between 2006 and 2017. Figure 1 plots for each strategy the difference in Sharpe ratio between rising and falling yield environments.

Figure 1: Difference in Sharpe Ratio between Rising Yield and Falling Yield Environments



Determined using monthly data from Jan 2006 to Jan 2017. Source: Barclays

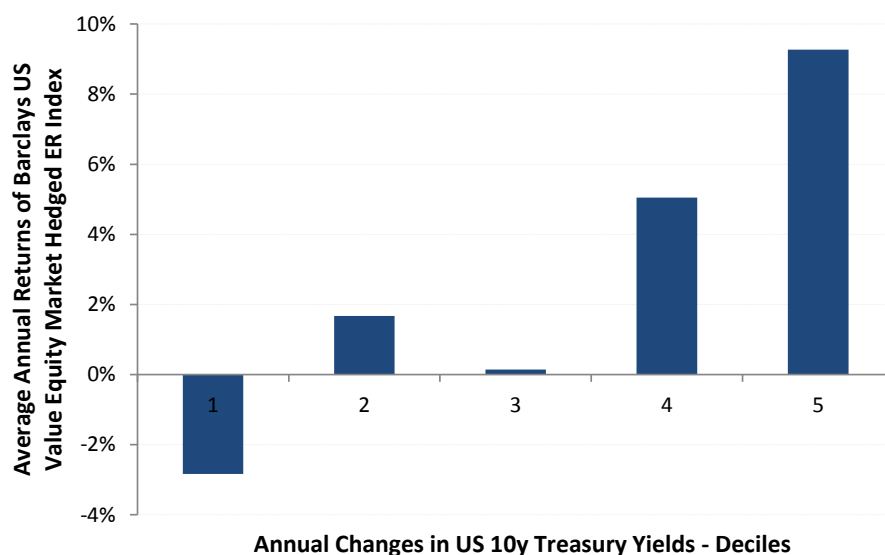
Before getting into details, it is important to emphasize that the behaviour of some alternative risk premia during rising and falling yield periods may not be structural and may implicitly be more related to the risk-on / risk-off nature of the relevant risk premia. In other words, a risk premia strategy that tends to perform best during equity rally periods, e.g. Equity Variance Risk Premium or Credit Carry, could potentially show an increased Sharpe ratio during environments of rising yield due to the long-term negative correlation between equities and bonds. With that in mind, we focus on a few select 'winners' and 'losers' from rising yields:

² The Barclays Merger Arbitrage US Strategy does not currently exist as an index

³ This is not a product of Barclays Research. This is a product of Barclays Sales and Trading. For Professional and Institutional Investors Only. Not for Retail Distribution. Investors in specific Asia Pacific countries should review important disclosures at the end of this document.

- *Value* stocks have historically outperformed in years of economic expansion, while growth stocks have been leading during periods when economies have struggled to grow. While this may seem counterintuitive, the below figure illustrates indirectly this point by emphasizing the statistically significant relationship between US value factor (Barclays US Value Equity Market Hedged Excess Return Index) and US 10y Treasury yields which tend to be on the rise during economic growth periods.

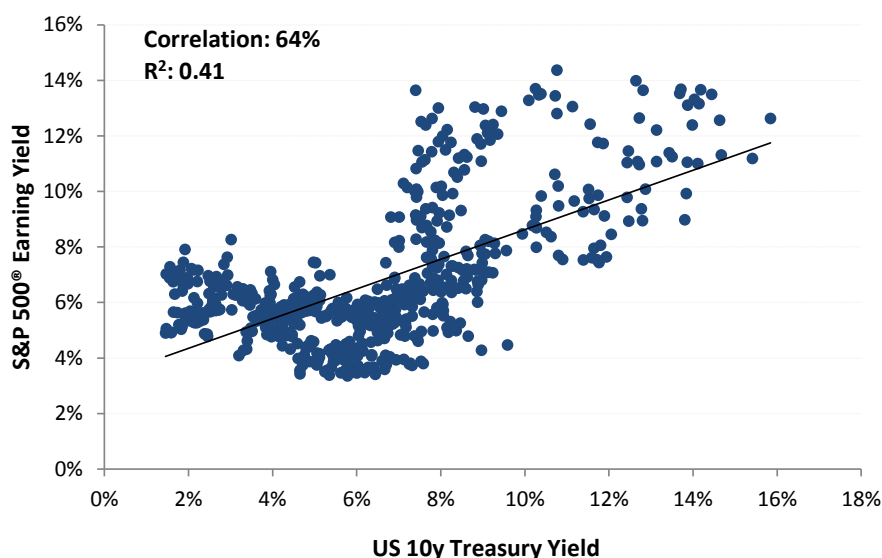
Figure 2: Annual Changes in US 10y Treasury Yields Sorted in Quintiles versus Corresponding Average Annual Returns for the Barclays US Value Equity Market Hedged Excess Return Index



Determined using data from Nov 2002 to Jan 2017. Barclays US Value Equity Market Hedged ER Index: BXIVMUE Index on Bloomberg. US 10y Treasury Yields: USGG10YR on Bloomberg. Source: Bloomberg, Barclays

One reason behind this relationship is that, when Treasury yields are on the rise, investors are less willing to pay high multiples for growth stocks valued on future earnings. In fact, as illustrated in figure 3, investors tend to ask on average over the long run for a higher earning yield when yields rise. Conversely, value stocks with strong existing cash flows tend to be favoured during rising yield periods, as more stocks participate in the rally and investors grow sensitive to valuations.

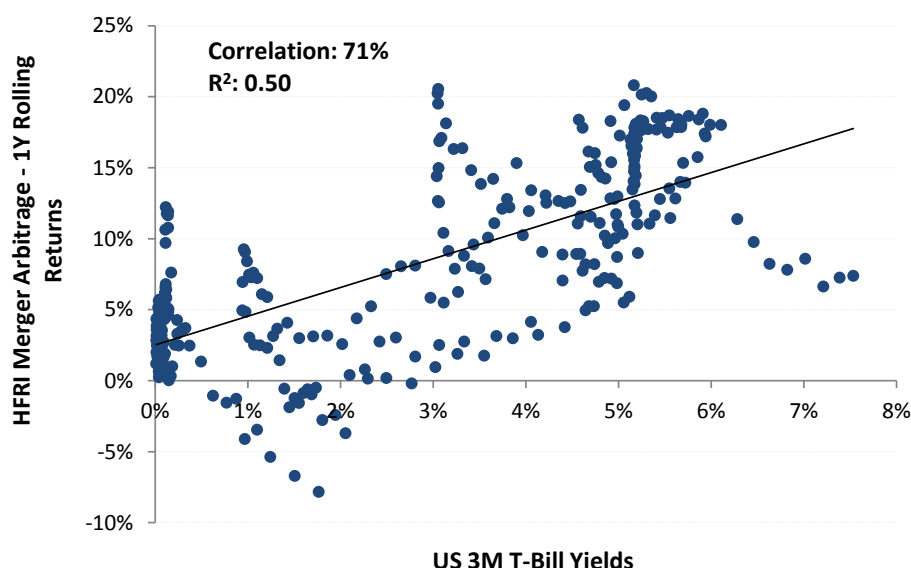
Figure 3: S&P 500® Earning Yield versus US 10Y Treasury Yield



Determined using data from Jan 1962 to Jan 2017. S&P 500®: SPTR on Bloomberg. US 10y Treasury Yields: USGG10YR on Bloomberg. Note that, while this positive relationship held over the period 1962 to 2017, it may not necessarily hold in a low yield environment. Source: Bloomberg, Barclays

- *Merger-arbitrage* benefits from rising interest rates for a number of reasons. Firstly, merger spreads – difference between the current price of the target stock and the consideration offered by the acquirer – offer rates of return that are composed of a spread, known as risk premium, over the cost of capital to account for the potential risk of terminated transactions. Higher interest rates therefore should drive arbitrage spreads higher. Additionally, the short rebate, i.e. the return earned from shorting stocks, increases with interest rates. The below figure emphasizes the positive relationship between US 3-month Treasury bill yields and one-year rolling returns of the HFRI Merger Arbitrage index over the period January 1990 - January 2017.

Figure 4: Merger-Arbitrage Historically Provided a Natural Hedge Against Rising Interest Rates



Determined using data from Jan 1990 to Jan 2017. HFRI Merger Arbitrage: HFRIMAI Index on Bloomberg. US 3M T-Bill Yields: USGG3M Index on Bloomberg. Note that HFRI Merger Arbitrage is a total return index hence naturally incorporates a funding component. Source: Bloomberg, Barclays

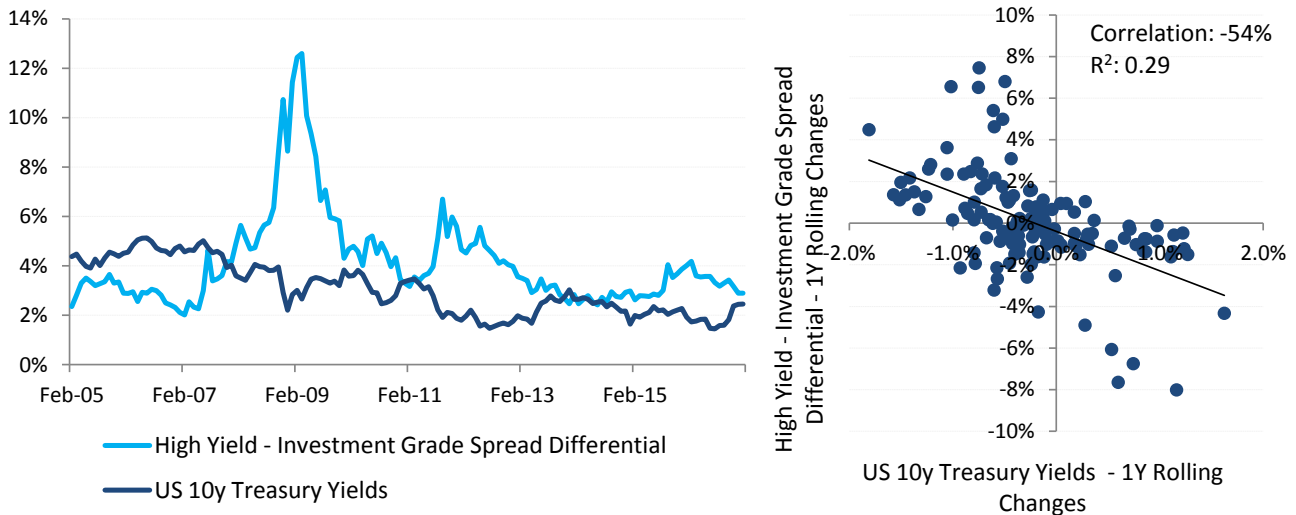
Merger arbitrage is in fact sometimes pitched as an alternative to bonds, as it has a similar risk-reward profile to bonds, as presented in the below table, but has the potential to perform during rates rising environment and utilises a different slice of the capital structure hence adding diversification:

Jan 1990 - Jan 2017	HFRI Merger Arbitrage Index	Barclays US Aggregate Bond TR Index
Annualised Total Return	8.03%	6.18%
Annualised Volatility	3.63%	3.64%

Determined using monthly data from Jan 1990 to Jan 2017. Source: Bloomberg, Barclays

- *Credit Carry* is a strategy designed to capture the risk premium differential between low quality and high quality credit by going long high yield and short investment grade, while *Equity Variance Risk Premium* aims to capture the implied versus realised premium available in options markets. Both alternative risk premia, being very much pro-cyclical, tend to underperform during risk-off periods, typically when a rush towards safe haven assets is observed and Treasury yields tend to rally. Conversely, such Credit Carry and Equity Variance Risk Premium strategies tend to perform best during risk-on periods when yields are likely to be stable or selling-off. Additionally, a Credit Carry strategy benefits by construction from spread compression between high yield and investment grade. The below figure emphasizes that spread compression – differential between high yield and investment grade spread narrowing – tends to occur during rising yield periods.

Figure 5: Spread Compression between High yield and Investment Grade Spreads is inversely related to US 10y Treasury Yields

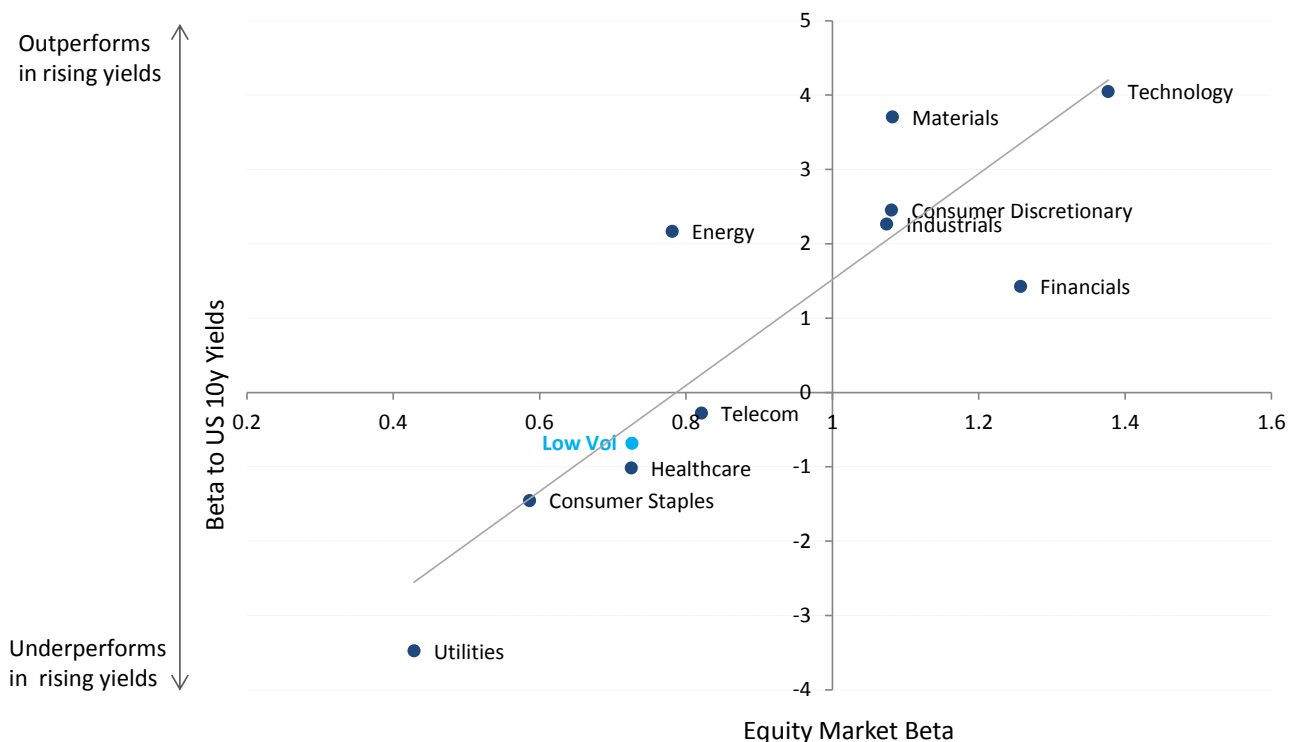


Determined using monthly data from Feb 2005 to Jan 2017. Source: Bloomberg, Barclays

- The negative interest rate sensitivity of *Low Volatility* or *Low Beta* strategies is well documented in the literature. In 'Low Volatility equity Strategies: Anomaly or Capital Structure Effect', August 2014, Barclays Research highlighted that differences in capital structure render Low Vol stocks as "bond proxies", while in the more recent paper 'Is the Low Vol bubble bursting', October 2016, Barclays Research highlighted that inflation, actually, has been the dominant driver of Low Vol performance.

The below figure highlights that low beta sectors such as utilities, consumer staples and telecoms are in the bottom left quadrant, hence tend to suffer from a rise in yields, while higher-risk sectors such as technology and industrials are in the top right quadrant reflecting their positive interest rate sensitivity.

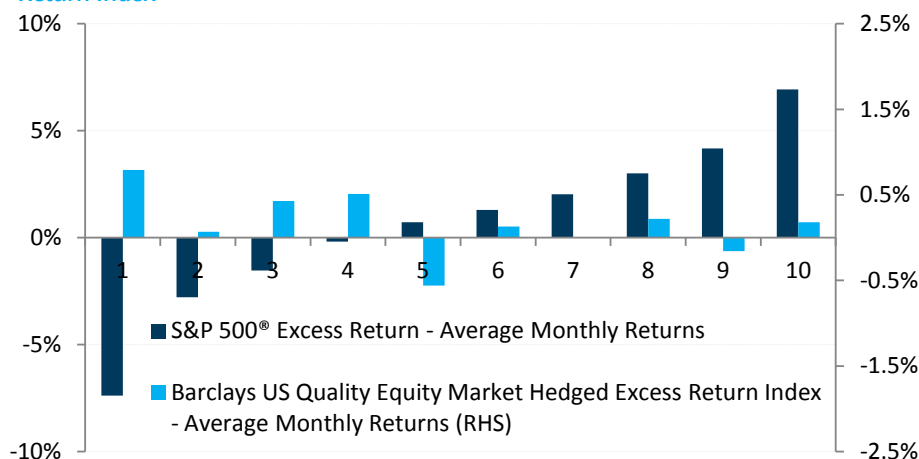
Figure 6: Interest Rate Sensitivity of Level 1 GICS Sectors in the US as a Function of Their Equity Market Beta versus the S&P 500®



Determined using monthly data from Sep 1989 to Jan 2017. Low Vol: M1USMVOL Index on Bloomberg. Level 1 GICS Sectors on Bloomberg: S5UTIL, S5CONS, S5TELS, S5HLTH, S5ENRS, S5MATR, S5COND, S5FINL, S5INDU and S5INFT Index. Source: Bloomberg, Barclays

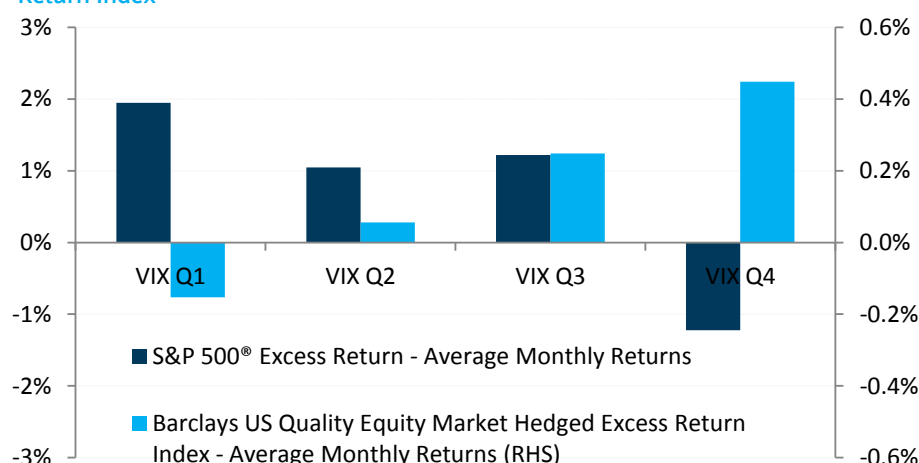
- ‘High quality’ or ‘high profitability’ stocks, typically defined as having low leverage, stable earnings and high return-on-assets (or return-on-equity), have been shown not only to deliver over the long run positive risk premium compared to low quality stocks, but also exhibit defensive characteristics as the strategy benefits from a flight to quality during crises. This was initially identified in the piece ‘Quality Minus Junk’ by Asness et al. (Oct 2013).

Figure 7: S&P 500® Monthly Excess Returns Sorted in Deciles versus Corresponding Average Monthly Returns for the Barclays US Quality Equity Market Hedged Excess Return Index



Determined using monthly data from Nov 2002 to Jan 2017. Barclays US Quality Equity Market Hedged Excess Return Index: BXIIKMUE Index on Bloomberg. S&P 500® Excess Return: SPTR minus 1m USD Libor. Source: Bloomberg, Barclays

Figure 8: VIX® Levels Sorted in Quartiles, Corresponding Average Monthly Excess Returns for S&P 500® and the Barclays US Quality Equity Market Hedged Excess Return Index



Determined using monthly data from Nov 2002 to Jan 2017. Barclays US Quality Equity Market Hedged Excess Return Index: BXIIKMUE Index on Bloomberg. S&P 500® Excess Return: SPTR minus 1m USD Libor. Source: Bloomberg, Barclays

While the interest rate sensitivity of high quality stocks has been a lot less discussed in the literature than Low Volatility, such defensive properties may to some extent explain the indirect relationship. In fact, rates tend to rally during equity sell-offs when quality stocks tend to outperform, which means that a quality factor will tend to underperform in relative terms during rates rising periods.

- With regards to *Rates Carry* and more generally any rates-related risk premia, there is an ongoing concern among investors that such strategies might be strongly biased towards generating positive excess returns during rates rally environments. This is a very legitimate concern as most of these rates risk premia have not experienced over their backtest or live periods any bond bear market lasting multiple years. As this is in our view a crucial question, we dedicate the next section to it.

Focus on Rates Risk Premia

While this will be common knowledge for most readers, we provide a brief refresher on the return drivers on rates strategies e.g. bond futures based strategies and start by considering a bond with T years to maturity, annual coupon payments of D , price P_t^T and yield to maturity y_t^T . Its returns can be decomposed into two components:

- ‘Carry’ returns i.e. the return on the bond if the entire term structure of interest rates stays constant i.e. $y_{t+1}^T = y_t^T$ for all maturities τ
- ‘Market Move’ returns, essentially the remaining portion of returns, which reflects returns stemming from changes in the level of interest rates

The ‘Carry’ return, i.e. assuming $y_{t+1}^T = y_t^T$ for all maturities τ , can be written as follows for the period T to $T + 1$:

$$\begin{aligned} \text{Carry} &= \frac{P_{t+1}^{T-1}(y_{t+1}^{T-1}) + D - P_t^T(y_t^T)}{P_t^T} \\ &= \frac{D}{P_t^T} + \frac{P_{t+1}^{T-1}(y_t^{T-1}) - P_t^T(y_t^T)}{P_t^T} \\ &\cong y_t^T - \text{ModifiedDuration} \times (y_t^{T-1} - y_t^T) \quad \text{assuming } y_t^T = \frac{D}{P_t^T} \end{aligned}$$

Therefore, the ‘Carry’ on an unfunded position i.e. in excess of a short-term risk-free rate or cost of funding r_t , for instance obtained via a bond future, can be written as follows:

$$\text{Carry} = \underbrace{(y_t^T - r_t)}_{\substack{\text{“Excess yield” or} \\ \text{“Term Spread”}}} - \underbrace{\text{ModifiedDuration} \times (y_t^{T-1} - y_t^T)}_{\text{“Rolldown”}}$$

This expression is important as it emphasizes that a long unfunded position on rates instruments, for instance a bond future, earns excess returns from:

- The term spread, i.e. the result of borrowing at the short end of the yield curve and lending further out on the curve, which is positive when the curve is upward sloping and increases as the curve steepens
- The rolldown along the yield curve which is positive when the curve is upward sloping and increases as the curve steepens
- Changes in yields which have a positive impact on a long position when rates are rallying

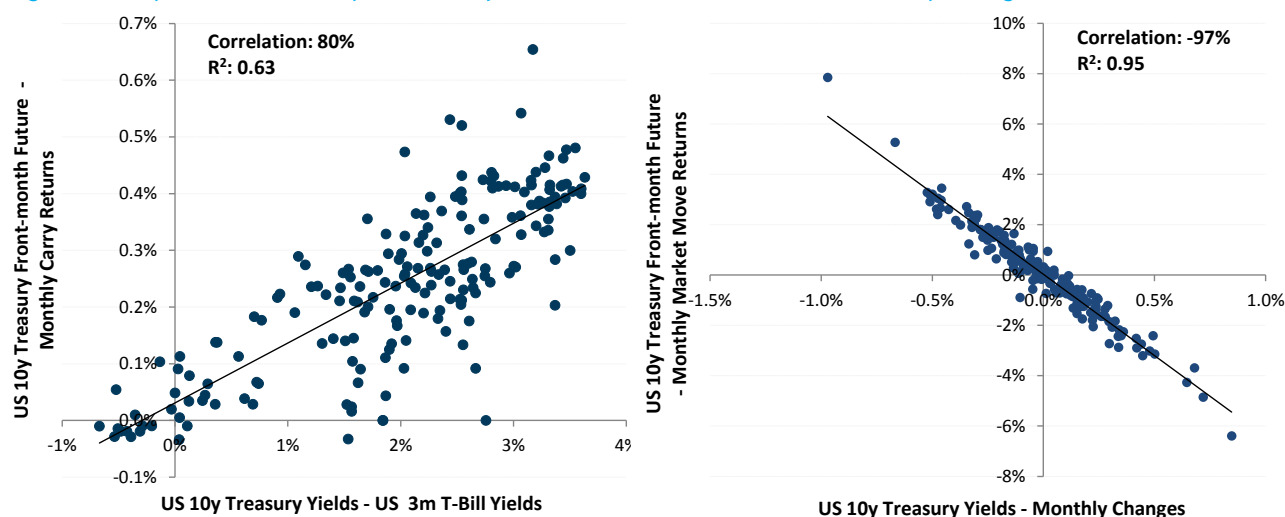
Conversely, a short unfunded position would pay away the term spread and rolldown, assuming the curve is upward sloping, and would earn a positive return in a rising yield period.

It is worth noting that the combination of the above term spread and rolldown components, i.e. the overall carry term, can be thought as being analogous to futures rolldown.

The below scatterplots illustrate the above points in the context of US 10y front-month Treasury futures and show that ‘Carry’ returns tend to increase as the curve steepens while ‘Market Move’ returns are without surprise negatively impacted by a rise in yields. It is important to mention that the yield curve has historically shown a tendency to flatten

during rising yield periods and vice-versa, i.e. either experiencing a bear flattening or bull steepening.

Figure 9: Carry Returns Driven by Curve Steepness and Market Move Returns Driven by Changes in Yields



Determined using monthly data from Nov 2000 to Dec 2016. US 10y Treasury Yields: USGG10YR Index on Bloomberg. US 3m T-Bills: USGG3M Index on Bloomberg. Carry returns are determined using futures rolldown, while Market Move returns correspond to the residual returns. Source: Bloomberg, Barclays

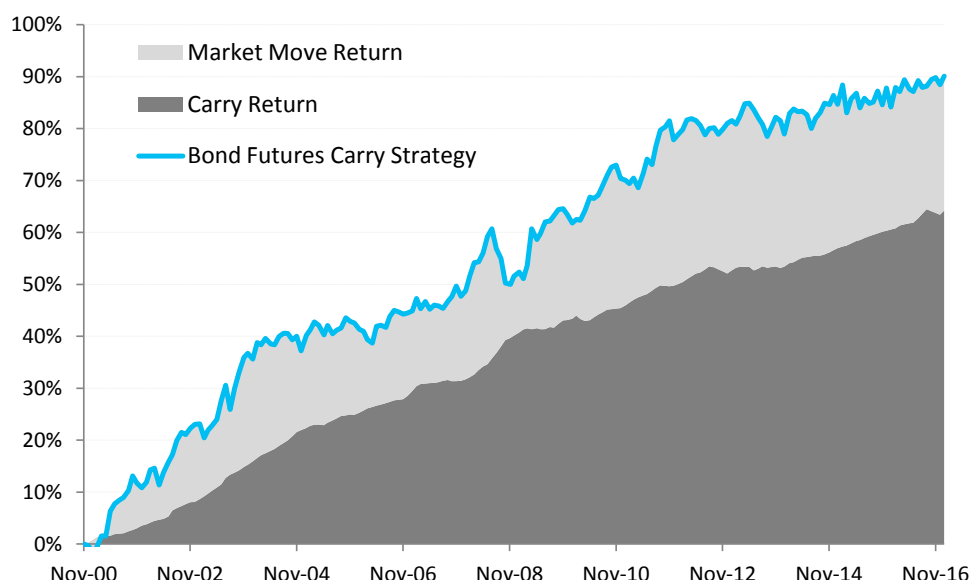
The most well-established alternative risk premia in the rates space are carry strategies also known as curve or term premium strategies. When implemented on bond futures, such risk premia strategies typically take long exposure to futures with highest carry – highest carry is equivalent to steepest curves as described previously – and short exposure to those with lowest carry. When implemented on money-market futures, they often take outright long exposures to deferred contracts, e.g. the 3m Libor 12m forward via the fourth futures contract, and may include a feature designed to switch to a short position during central bank hiking cycles.

From the earlier analysis of return drivers for rates strategies, we can deduce the impact of rising yields on a rates carry strategy implemented on bond futures (long-short implementation described in previous paragraph). As a steep yield curve reflects market expectations of rising yields as well as high required term premium, we make the realistic assumption that curves on the long leg of the strategy are those which are most likely to experience rises in yields. Therefore:

- Short-term impact of rising yields on such a bond futures carry strategy is likely to be negative
- Longer-term impact is likely to be positive as expected carry differential between highest and lowest yielding bond futures will tend to increase

In a falling yield environment such as the one experienced for the past many years, global yields are likely to rally altogether, which means that the market move impact is less obvious to determine. The below chart emphasizes that in practice such a bond futures carry strategy has historically benefited from a rally in yields.

Figure 10: While Bulk of Returns of Bond Futures Carry Strategy Stemmed Historically from Carry Returns, Strategy Also Benefitted from the Rally in Yields

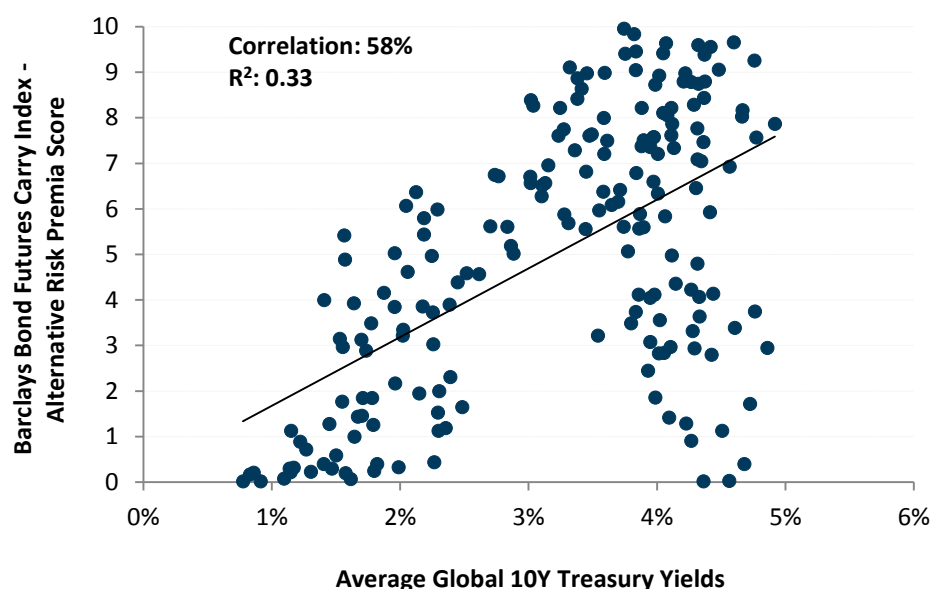


Determined using monthly data from Nov 2000 to Dec 2016. Note: the Bond Futures Carry Strategy used in this analysis is not identical to the Barclays Bond Futures Carry Index as it does not incorporate any trading costs. Source: Barclays

Barclays Alternative Risk Premia Scores measure on a scale of 0 to 10 how rich or cheap the relevant risk premia currently is compared to its history. In the context of the Barclays Bond Futures Carry Index, its Alternative Risk Premia Score measures the carry differential between the highest and lowest yields bond futures compared to its history.

The below figure confirms that, as global Treasury Yields – across US, Germany, UK, Japan, Canada and Australia which corresponds to the six markets underlying the Barclays Bond Futures Carry Index – increase, a strategy aiming to harvest carry returns in the rates space tends to become more attractive.

Figure 11: Attractiveness of Barclays Bond Futures Carry Index Increases with Average Global Treasury Yields



Determined using monthly data from Nov 2000 to Dec 2016. Barclays Bond Futures Carry Index: BXIBFCU Index. Global 10Y Treasury Yields: USGG10YR, GDBR10, GUKG10, GJGB10, GCAN10YR and GACGB10 Index on Bloomberg. Source: Barclays

With regards to a rates carry strategy implemented on money market futures (taking outright exposures as described earlier), assuming the money-market forward curve is upward sloping, we can easily deduce that:

- When money market rates are stable or rallying, the strategy will benefit both from positive “carry” or rolldown and potentially from positive market moves
- When money market rates are selling off, assuming that the strategy is well-positioned, i.e. short futures, the market move impact will be positive but rolldown impact will be negative

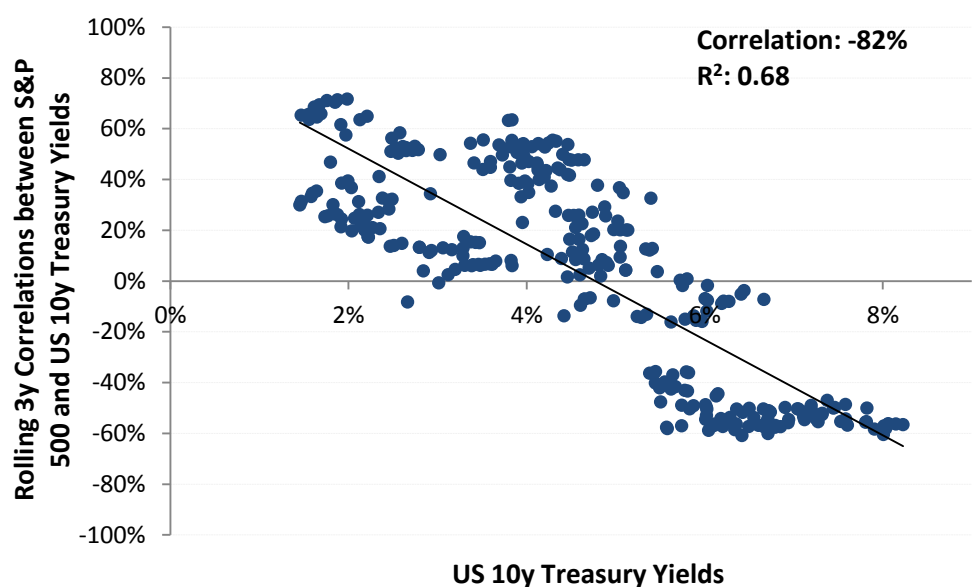
Such a strategy will therefore tend to generate highest excess returns during stable or rallying rates environments.

A Higher Viewpoint

In practice, the sensitivity of alternative risk premia strategies to rising and falling yield environments cannot be considered in isolation from other exposures an investor may have in his overall portfolio. A typical investor, e.g. a pension fund would most likely have large traditional risk premia exposure in his portfolio, in particular equity and sovereign bond beta. While we’ll spare the reader any explanation around the behavior of Treasury bonds during rising yield periods, the historical relationship between equities and yields is in our view often less well understood.

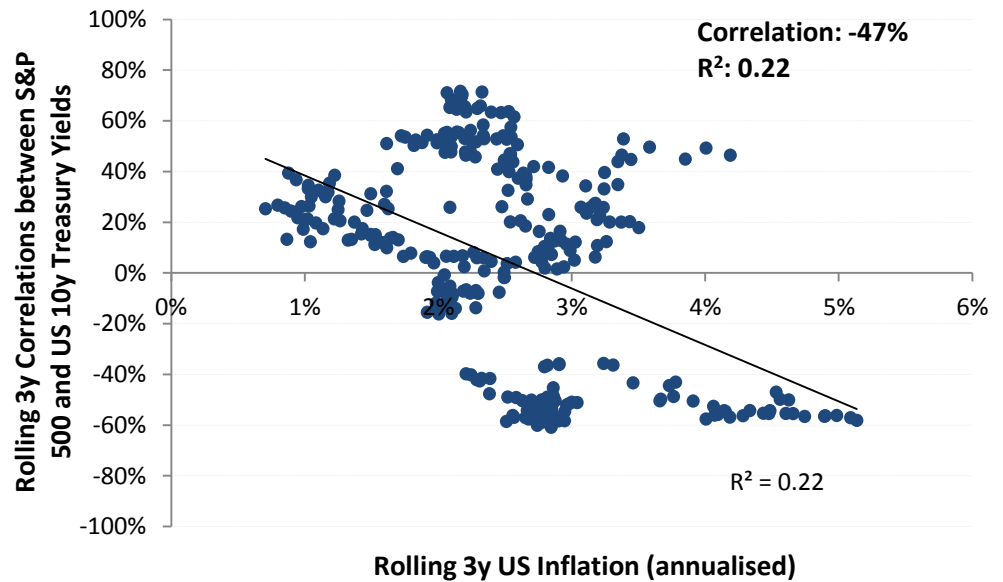
Figures 12 and 13 show that the historical relationship between US equities and US Treasury yields tends to be positive in “normal” environments – in other words, the correlation between US equities and Treasury bonds is negative in these periods – and turns negative when yields or inflation are elevated. Environments where yields or inflation are high tend to coincide with periods when the economy reaches the end of its expansion phase and is overheating. During such periods, central banks and governments tend to be tightening their monetary and fiscal policies, and it becomes expensive for companies to borrow money, hence negatively impacts their ability to grow profits. In summary, equities typically cope with moderate inflation, but when yields or similarly inflation rises beyond certain levels, equities tend to have a harder time.

Figure 12: Correlation between Equities and Treasury Yields Tend to Become Negative as Yields Increase Above ~5%



Determined using monthly data from Jan 1988 to Jan 2017. Source: Bloomberg, Barclays

Figure 13: Correlation between Equities and Treasury Yields Tend to Become Negative as Inflation Increase Above 3-4%



Determined using monthly data from Feb 1988 to Jan 2017. US Inflation: CPURNSA Index on Bloomberg. Source: Bloomberg, Barclays

It is important to highlight that this question of the relationship between equities and yields, in other words the correlation between equities and bonds, is a hotly debated area and we refer the interested reader to the paper 'Stock-Bond Correlations' by Ilmanen (Sep 2003) for in-depth analysis of the topic.

Concluding Remarks – Balancing a Portfolio Exposure to Rising and Falling Yield Environments

In this study, we highlighted the likely beneficiaries of rising yields such as equity value factor, merger-arbitrage and credit carry, and those factors likely to underperform such as low volatility, quality and rates carry. We provided further details on the potential impact of rising yields on rates alternative risk premia given the legitimate concern from investors that such strategies might be biased towards generating positive excess returns during rates rally environments.

Whilst such conclusions may help investors tilt their portfolio depending on their expectations of the rates environment to come, we anticipate the most likely benefit will be in helping investors balance their portfolio to give it potential to behave well throughout rising and falling yield environments.

Common risk premia portfolio construction methodologies, e.g. inverse volatility weighting, equal risk contribution, maximum drawdown parity, do a good job at equalizing the chosen measure of risk. They are, however, not designed to balance factor exposure in a portfolio. We argue that, during the selection phase within a portfolio construction framework, there should be a strong strategic focus on factor exposure to ensure a good balance at the portfolio level. In the context of this study, balancing portfolio exposure to rising and falling yield environments could mean, for instance, selecting a comparable number of strategies with positive and negative sensitivity to sovereign bond yields, and monitoring nominal rates factor exposure at the portfolio level. Such an approach to constructing a risk premia portfolio with a focus on factor exposure will be expanded upon in an upcoming QIS Insights article. Stay tuned.

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Appendix: Index Information

RISK PREMIUM	STRATEGY	TICKER	INDEX NAME	INDEX LIVE DATE	INDEX BASE DATE
Carry	FX Carry	BFXSW5UE	Barclays Benchmark World Carry Excess Return Index	Aug 2011	Jan 2002
	Rates Carry	BXIIBFCU	Barclays Bond Futures Carry Index	Apr 2015	Nov 2000
	Credit Carry	BCRIHGBA	Barclays Atlantic HYIGS Beta Credit Index	Nov 2012	Feb 2005
	Commodity Carry	BCCFBA3P	Barclays Backwardation Alpha Bloomberg CI Index ER	Nov 2010	Jan 2000
Momentum	US Equity Momentum	BXIIMMUE	Barclays US Momentum Equity Market Hedged Index ER	Jul 2014	Dec 2002
	Eurozone Equity Momentum	BXIIMMEE	Barclays Eurozone Momentum Equity Market Hedged Index ER	Jul 2014	Oct 2004
	UK Equity Momentum	BXIIMMGE	Barclays UK Momentum Equity Market Hedged Index ER	Jul 2014	Oct 2004
	Japan Equity Momentum	BXIIMMJE	Barclays Japan Momentum Equity Market Hedged Index ER	Jul 2014	Jul 2005
	Cross-Asset Trend Following	BXIIXTAP	Barclays Cross Asset Trend Index	Apr 2013	May 2002
Value	US Equity Value	BXIIVMUE	Barclays US Value Equity Market Hedged Index ER	Sep 2014	Nov 2002
	Eurozone Equity Value	BXIIVMEE	Barclays Eurozone Value Equity Market Hedged Index ER	Sep 2014	Dec 2004
	UK Equity Value	BXIIVMGE	Barclays UK Value Equity Market Hedged Index ER	Sep 2014	Dec 2004
	Japan Equity Value	BXIIVMJE	Barclays Japan Value Equity Market Hedged Index ER	Sep 2014	Aug 2005
	FX Value	BXIIVEUS	Barclays FX Value US EE Index	Jan 2009	Jan 2000
Volatility	Equity Variance Risk Premium	BXIISVUE	Barclays US Short Variance Index ER	May 2013	Jan 2004
Other	US Equity Low Volatility	BXIILMUE	Barclays US Low Volatility Equity Market Hedged Index ER	Apr 2013	Dec 2002
	Eurozone Equity Low Volatility	BXIILMEE	Barclays Eurozone Low Volatility Equity Market Hedged Index ER	Apr 2013	Oct 2004
	UK Equity Low Volatility	BXIILMGE	Barclays UK Low Volatility Equity Market Hedged Index ER	Apr 2013	Oct 2004
	Japan Equity Low Volatility	BXIILMJE	Barclays Japan Low Volatility Equity Market Hedged Index ER	Apr 2013	Jul 2005
	US Equity Quality	BXIIKMUE	Barclays US Quality Equity Market Hedged Index ER	Sep 2014	Nov 2002
	Eurozone Equity Quality	BXIIMJEE	Barclays Japan Quality Equity Market Hedged Index ER	Dec 2015	Dec 2004
	UK Equity Quality	BXIIKMGE	Barclays UK Quality Equity Market Hedged Index ER	Sep 2014	Dec 2004
	Japan Equity Quality	BXIIKMJE	Barclays Japan Quality Equity Market Hedged Index ER	Sep 2014	Aug 2005
	Merger Arbitrage	- ⁴	Barclays Merger Arbitrage US Strategy	-	Jan 2006

⁴ The Barclays Merger Arbitrage US Strategy does not currently exist as an index

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