

Seeking Effective Diversification Amid Rising Correlations

November 2016

WHITE PAPER

We live in unsettling times. Geopolitical tensions remain high with electorates struggling to determine which outcome or candidate can shape a better future. Rising threats from terrorism have provoked anti-immigration sentiment within the developed world. Growing socio-economic imbalances have resulted in a discontented youth and consequent anti-establishment uprisings.

The list of unsettling events seem endless and their impact on markets potentially profound, particularly against a fragile macro backdrop. With the decreasing efficacy of central banks to soften the blow, uncertainty has led to more frequent and deeper sell-offs. As a result, drawdown mitigation hence, the need for diversification should be high on investors' list of concerns. Diversification¹ can pay off when assets are not (or more realistically less) correlated with one another. However, where does an investor hide when historical correlations break down and everything becomes positively correlated to everything else?

In this paper, we discuss how our multi-asset investment process seeks effective diversification by diversifying risk across several low correlated strategies. We believe that this differentiates us from other multi-asset managers, who diversify actively across asset classes but do not take into consideration an asset's risk contribution in a portfolio. Risk-parity strategies are more popular nowadays, these go a step further by allocating risk equally across asset classes. However, we believe they may not be able to capture the best opportunities from a return perspective as they may be too passive in their risk allocation and could ultimately underperform passive balanced strategies.

To explain how we seek to diversify risks effectively in this low growth and low return backdrop, we first review the primary investment risks and challenges.

The Risk Conundrum

Not only are risks on the rise, the very nature of risks is changing due to a constantly evolving regulatory landscape and repressed yields. "Innovations" such as NIRP (Negative Interest Rate Policy) implemented by some central banks to boost economic growth by stimulating bank lending, have instead led to a massive distortion in asset prices. As a result, value in global government bond markets appears to have disappeared. \$8.1 trillion of bonds now trade with negative yields (Chart 1).

Chart 1: \$8.1 Trillion Global Government Bonds Trading with Negative Yields



Source: J.P. Morgan. Data as at 12 October 2016.

¹Diversification does not ensure a profit or protect against a loss.

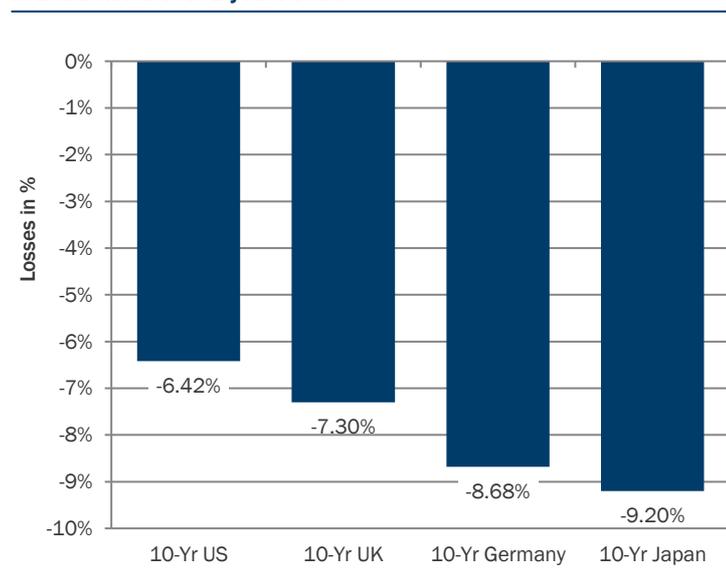
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Despite their negative yields, demand has persisted for reasons, varying from positive real yield potential amid a deflationary backdrop to positive carry from longer-dated maturities to diversification. More concerning is the rise in demand for negative yielding bonds due to regulatory policies; introduced in response to the Global Financial Crisis of 2008 to make financial markets safer. Basel III, for instance, sets tighter capital requirements that ultimately penalise higher risk assets such as equities through a higher risk-weighting and thus lower allocation. Due to such restrictive regulatory policies, banks have no choice but to hold such negative yielding assets on their balance sheets to make themselves appear “safer”.

Let’s assess how resilient these negative yielding “safe haven” assets are from the perspective of duration risk. Chart 2 illustrates that a pick-up in yields is likely to have an adverse impact on already stretched bond valuations. For instance, a 1% rise in German bond yields could wipe out almost -8.7% off a 10-year maturity over a one-year period².

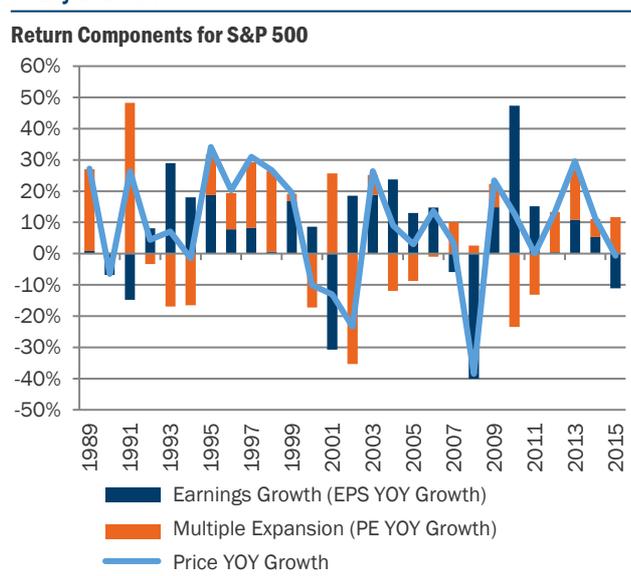
Amid suppressed bond yields, fixed income investors are cornered and left to chase higher yielding assets. If deteriorating fundamentals are ignored, in some assets, this could result in bubble-like valuations. Equities appear to us to be one such asset class. U.S. equity markets, for instance, returned positively in recent years despite a lack of sustained earnings growth. A breakdown of the total returns of the S&P 500 Index (Chart 3) reveals that earnings have been decreasing since 2010. Financial engineering tactics such as stock buybacks or cost cutting initiatives through labour reduction have boosted prices, while earnings have actually been shrinking. In 2015, earnings declined by -11%, but a multiple expansion of approximately +12% helped the S&P 500 Index end the year with flattish total returns.

Chart 2: Potentially Significant Losses on Bond Values From 1% Rise in Bond Yields Over 1-year Period



Source: Bloomberg. Data as at 1 October 2016.

Chart 3: Financial Engineering at Play: Is Multiple Expansion Really Growth?



Source: Pioneer Investments, S&P. Annual data at year end from 1989 to 2015.

An environment of persistently negative rates may result in an even bigger distortion in equity valuations. Lower interest rates will theoretically boost stock values as expected future cash flows are discounted using these rates. To illustrate this, we used a dividend discount model to calculate the net present value of a stock with dividends assumed to be growing by 6% into perpetuity³.

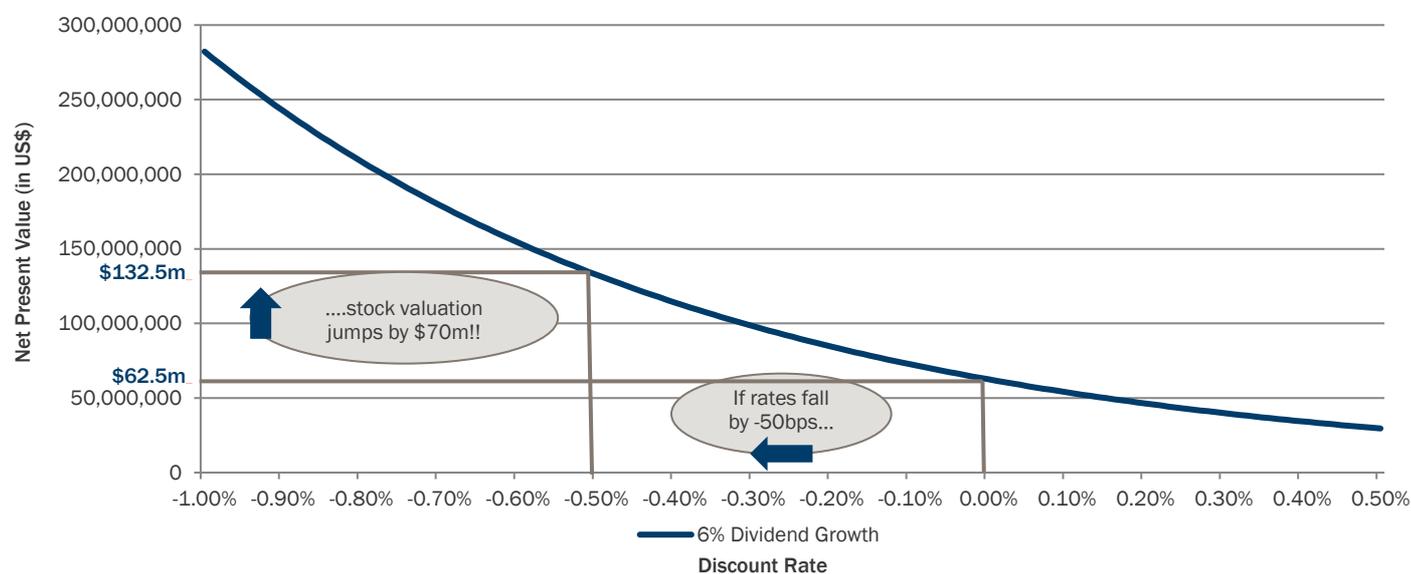
²Source: Bloomberg. Data as at 1 October 2016.

³Perpetuity defined as 150 years in the analysis

As demonstrated in Chart 4, a stock's value will jump by \$70 million with a -50bps fall in interest rates to -0.50%. As irrational as it may seem, present values could spike to infinity at deeply negative rates!

Chart 4: With Negative Rates, A Cash Generating Equity will Have Extreme Valuations

Equity Valuation Using a Dividend Discount Model



Source: Pioneer Investments, INTL FCStone Financial Inc. For Illustrative Purposes Only. Not meant to represent performance of any specific stock.

Corporate debt, especially the higher yielding sectors, has also been an asset class of choice for yield-seeking investors. Although the asset class has benefited from strong investor flows, a large proportion of these flows are through index trackers, such as Exchange Traded Funds (ETFs)⁴. ETFs are passive in nature and do not discriminate between countries and sectors where they allocate capital. We believe this has also resulted in a rise in valuations of potentially more fragile credit sectors, where companies with fundamentally weak balance sheets have taken advantage of the low yield environment to re-leverage. Spreads across some sectors may not account for this credit risk due to the technical support from investor flows. However, if the earnings outlook deteriorates from here on, we could potentially see a rise in default activity.

In our view, investor flows are likely to reverse if defaults pick up. However, there may be insufficient buyers to provide market liquidity when required. Investment banks' dealer desks, traditionally the market makers, could be restricted from participating due to regulatory costs. Therefore, they may be unable to provide liquidity when required which may create more pressure on prices during sell-offs.

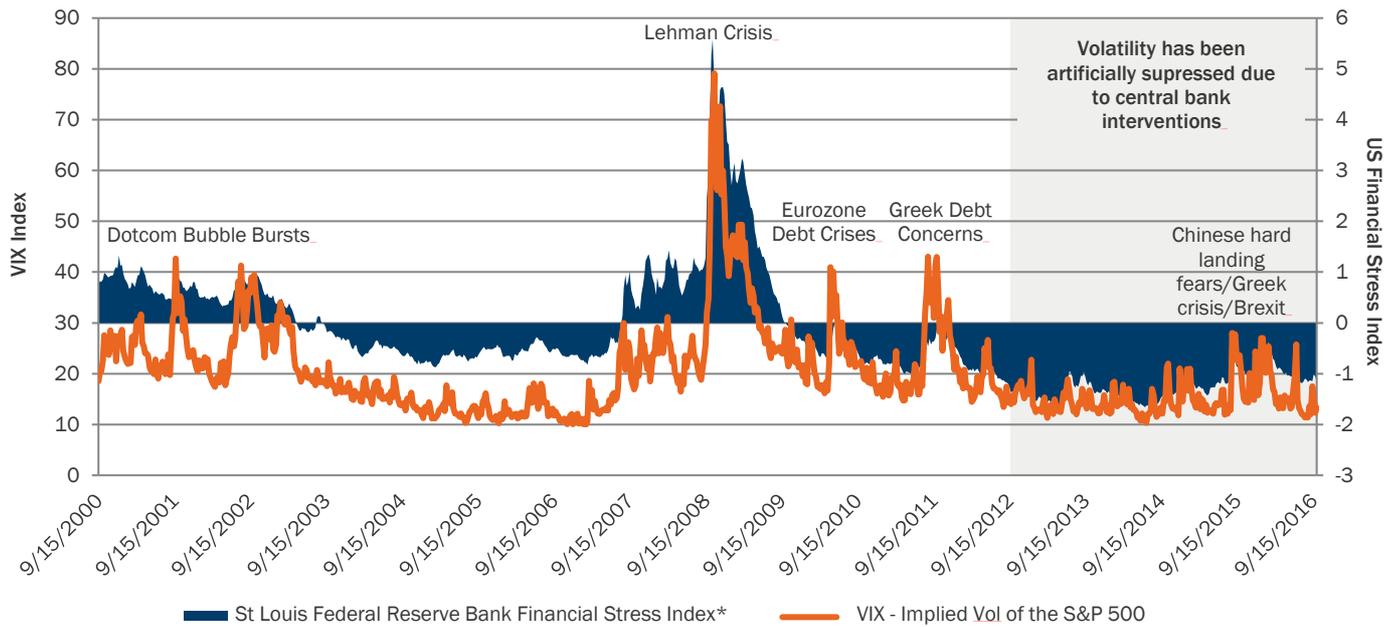
Additionally, investors appear to re-balance portfolio risk during bouts of volatility using equities rather than credit. We believe that this is a consequence of the relatively high levels of liquidity associated with equities. As evident from Chart 5 (next page), the volatility of the equity markets, using VIX⁵, almost exactly mirrors the degree of financial stress in the markets as indicated by the St Louis Federal Reserve Bank Financial Stress Index⁶.

⁴Source: Strategic Insight Simfund data as of November 2016

⁵The VIX Index measures the implied volatility of the S&P 500.

⁶The St Louis Federal Reserve Bank Financial Stress Index measures the degree of financial stress in the markets and is constructed from 18 weekly data series: seven interest rate series, six yield spreads and five other indicators. Each of these variables captures some aspect of financial stress. Accordingly, as the level of financial stress in the economy changes, the data series are likely to move together. The average value of the index, which begins in late 1993, is designed to be zero. Thus, zero is viewed as representing normal financial market conditions. Values below zero suggest below-average financial market stress, while values above zero suggest above-average financial market stress.

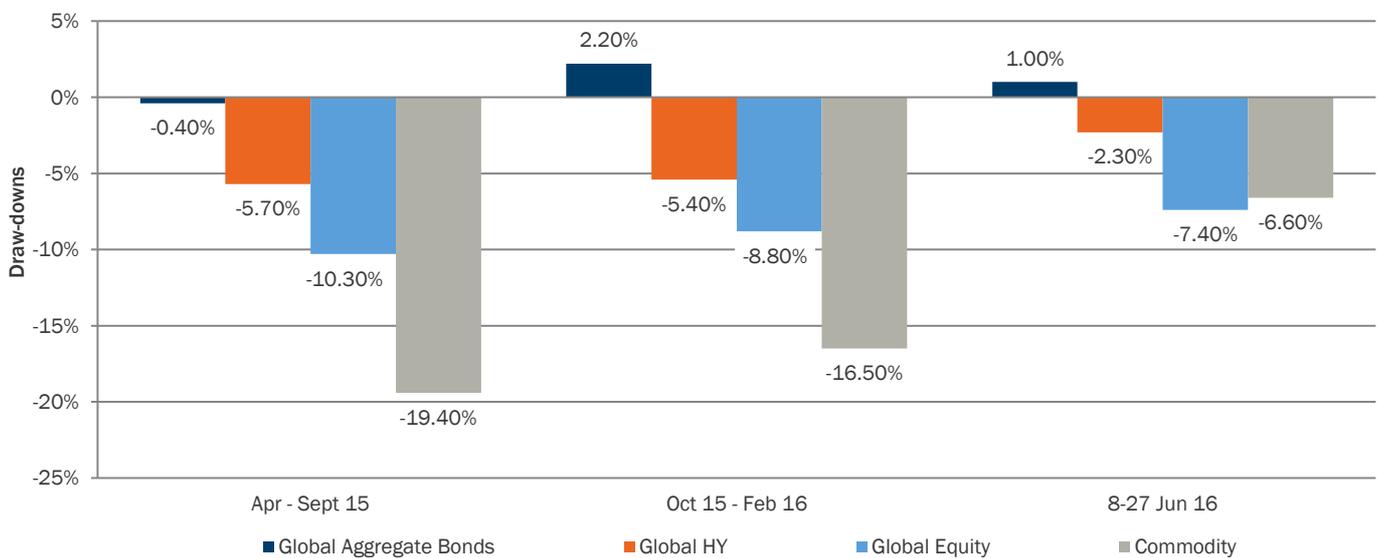
Chart 5: Equity Market Volatility has been Highly Correlated to Leading Stress Indicators



Source: Bloomberg. Data from 15 September 2009 to 30 September 2016. Past performance is no guarantee of future results.

Equity sell-offs during risk-off events are hence exaggerated and relatively more significant than high yielding bond sectors, as shown in Chart 6. We estimate that this may be a result of investors' inability to find liquidity in bond sectors in order to reduce risk when required. Safe havens such as developed market government bonds, on the other hand, could benefit in this scenario. However, liquidity in these *seemingly* liquid sectors could also dry up, given the supply scarcity resulting from central banks' ever-expanding bond purchase programmes.

Chart 6: Lower Drawdowns Sustained by Less Liquid Corporate Sectors; Investors May Be Using Equities to Re-Balance Risk Exposure



Source: Bloomberg. Data as 31 August 2016. Global Aggregate = Barclays Global Aggregate Bond Index, Global HY = Merrill Lynch Global High Yield Index, Global Equity = MSCI World Index, Commodity = S&P GCSI Commodity Index. All indices are total return in USD. Past performance is no guarantee of future results.

In an environment of rising credit and liquidity risks as highlighted above, we believe that the risk paradigm for the next decade is changing. Although volatility is likely to persist due to global geopolitical events, it is no longer the only consideration for

investors seeking diversification. Investors must also consider the impact of rising credit and liquidity risks as central banks transition away from years of excessive monetary stimulus (Chart 7). These market challenges may be aggravated if yield-hungry investors continue to ignore fundamentals and crowd into higher yielding assets leading to a further distortion in prices and correlations.

Chart 7: A Changing Risk Paradigm: Credit and Liquidity Risks are Rising



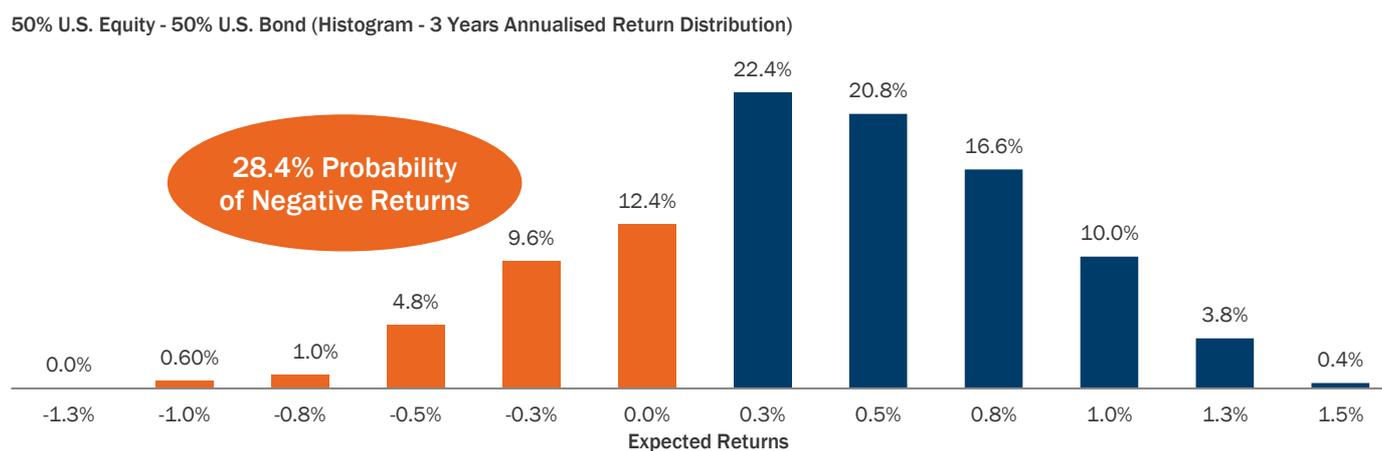
Source: Pioneer Investments. For Illustrative Purposes Only.

The Diversification Conundrum: Rising Asset Correlations

Against a challenging investment backdrop, we estimate that the return potential across traditional assets, such as bonds and equities, has fallen. Moreover, their return distribution is narrower and the probability of negative returns is significant. Based on our 3-year annualised return forecast for an equally balanced U.S. bond and U.S. equity portfolio⁷, we estimate a 28.4% probability of negative returns over a 3-year horizon (Chart 8).

In order to reduce the probability and magnitude of losses, we think investors should consider increasing the allocation to uncorrelated assets in their portfolios.

Chart 8: 28.4% Probability of Negative Returns (Estimate)



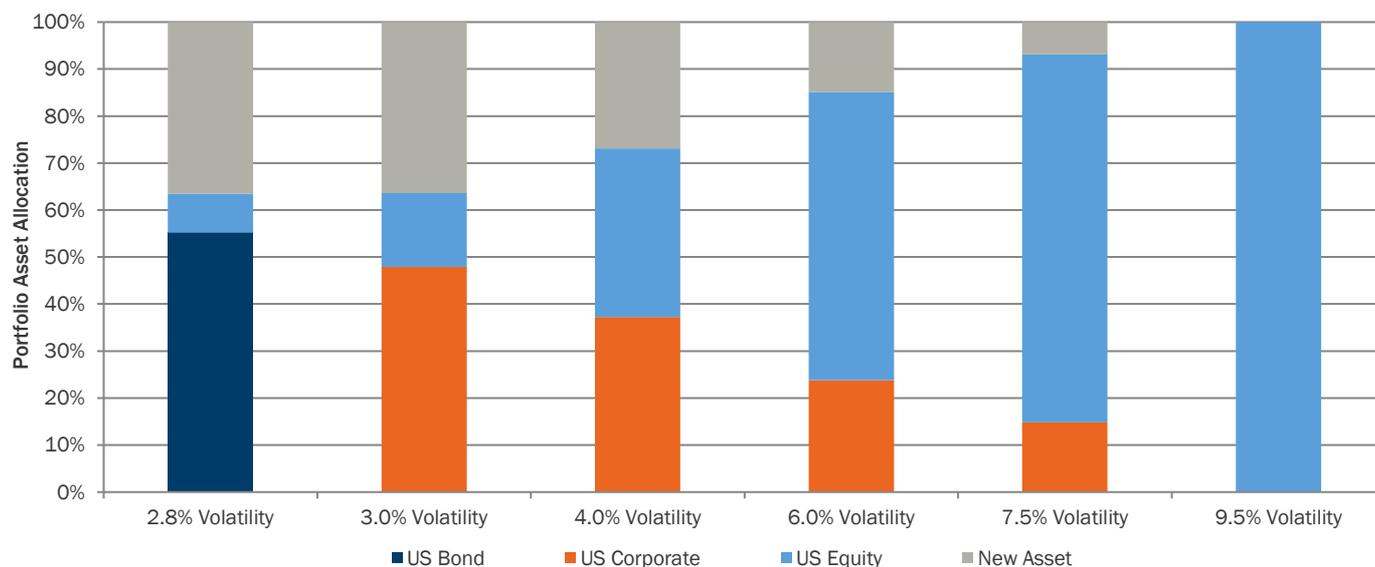
Source: Pioneer Investments. Data as at 29 July 2016. *Based on Pioneer Investments' estimate of 3 Year Forward Annualized Return for U.S. Bond and U.S. Equity. U.S. Bond is a proxy for the U.S. Aggregate Bond Index (combines 20% U.S. Corporate IG and 80% U.S. Government). For illustrative purposes. Not meant as a recommendation to buy or sell any particular security. There can be no assurance that this forecast will come to pass.

⁷ Using Pioneer Investments' return forecasts over a 3-year Horizon for Barclays U.S. Aggregate Bond TR Index for U.S. Bond and Morgan Stanley North America TR Index for U.S. Equity.

An allocation to uncorrelated assets, even one with negative return potential, can help reduce portfolio volatility, especially during down-markets. Chart 9 illustrates the results of a risk-return optimisation of a diversified portfolio of U.S. government bonds, U.S. corporate bonds and U.S. equities after adding a hypothetical new asset. We assumed that this new asset has a negative correlation of -0.1 with bonds and equities. To present a realistic scenario, we also assumed a negative expected return of -0.8% over a 1-year horizon and a volatility of 5% for the new asset. The optimisation concludes that, despite its negative returns, the negatively correlated new asset adds value by reducing volatility and thus diversifying risk. In fact, the lower the risk appetite of investors, the higher optimal allocation should be to negatively correlated asset classes.

Chart 9: Adding a Hypothetical Negatively Correlated Asset helps Reduce Portfolio Volatility

Risk Optimised Asset Allocation*



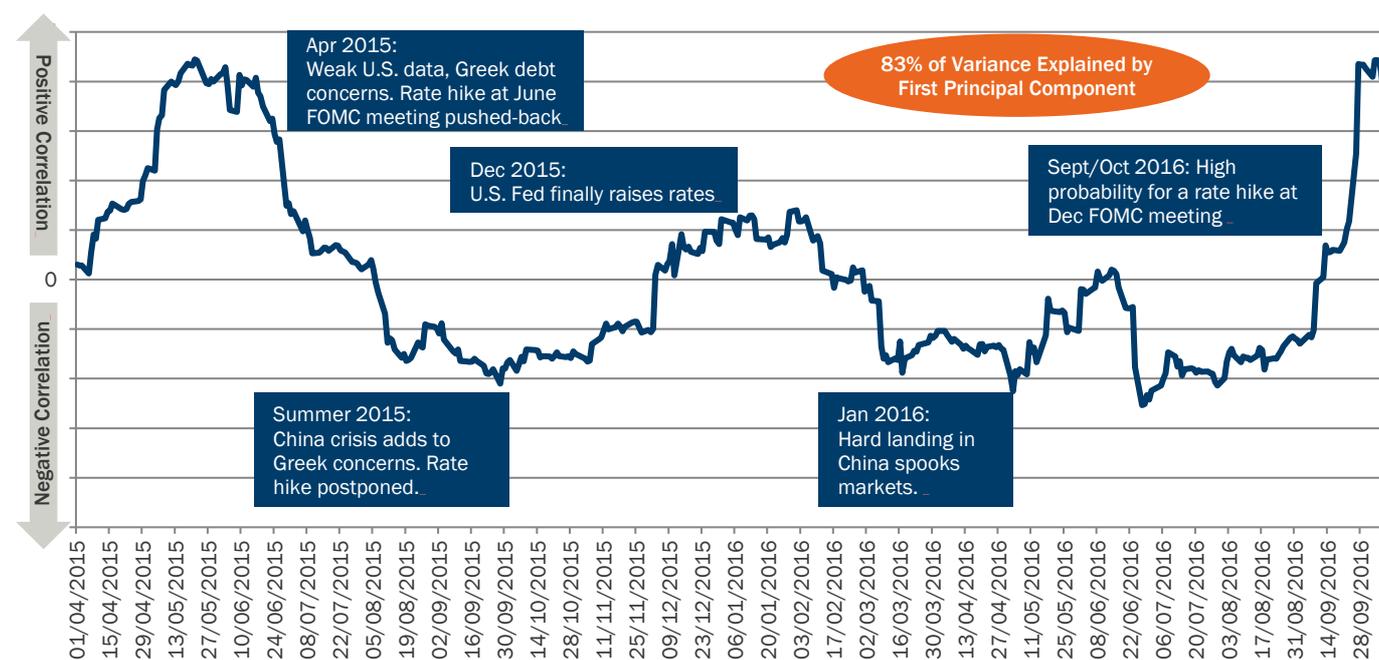
Source: Pioneer Investments. Data from 12 March 1999 to 7 October 2016.

*Based on Pioneer Investments' forward looking 1-year returns for U.S. Bond (JPM U.S. Govt), U.S. Corporate (Barclays U.S. Corporate) and U.S. Equity (MSCI USA Total Return Net Dividend) For illustrative purposes. Not meant as a recommendation to buy or sell any particular security. There can be no assurance that this forecast will come to pass.

But where have all the uncorrelated assets gone? We postulate that continued bond purchases by central banks in an effort to support global growth has resulted in a positive correlation across all major assets. This includes historically uncorrelated assets such as government debt. To test this hypothesis, we analysed the cross-asset correlations between government bonds, investment grade credit, high yield credit and equities in the U.S. since April 2014, using a Principal Component Analysis (PCA)⁸. Although a PCA does not conclude specifically what variables drive the variation in data, the analysis transforms variables into principal components and orders them so that the first principal component explains the highest variation.

Our PCA concludes that the first principal component explained a significant 83% in the variability in correlations. While we cannot conclude with certainty what this principal component is, we hypothesise that it could be explained by the U.S. Federal Reserve's ("Fed") monetary policy actions. In our view, the overlap of this component with evolving market expectations on the Fed's policies cannot be purely coincidental as demonstrated in Chart 10 (next page). For instance in recent months, the market has started pricing in a higher probability of the Fed hiking rates. A normalisation in rates has resulted in falling bond prices as expected but uncharacteristically has also dampened the outlook on equities, resulting in sell-offs. Bonds and equities, typically uncorrelated assets, are moving in the same direction as demonstrated in Chart 10.

⁸PCA is a statistical technique for interpreting correlations in data sets with a large number of interrelated variables. The presence of several variables is likely to result in several pairwise correlations, whose interpretation may be challenging. Essentially, PCA identifies the most statistically significant linear combinations. The first principal component has the largest possible variance i.e. explains as much of the variability in the data as possible. Thus a group of variables driven largely by a common factor will have a first principal component analysis with a significantly high variance (typically +70%)

Chart 10: Asset Prices Appear to Have Been Influenced by Central Bank Policy


Source: Pioneer Investments. Data from 12 March 1999 to 7 October 2016. For illustrative purposes only.

The Diversification Conundrum: Rising Asset Correlations

Amid rising cross asset correlations, we believe that effective diversification can be achieved by allocating risk across low correlated investment strategies. An independent but collaborative investment process is able to generate low correlated strategies in our view. This encourages an independence in mind-set and risk taking across idea generators, thus enhancing the prospect of truly diverse ideas that are independent from other portfolio strategies.

Our multi-asset investment process encourages experienced specialists in a particular asset class or strategy to work autonomously to build their investment strategies. They aim to generate ideas inspired by a different investment theme, which is not only different from our top-down macro scenario but also from other trades in the portfolio.

Specialists also collaborate with other multi-asset investment teams to share and develop their independently-generated investment strategies. This allows for a cross-fertilisation of ideas across our wide multi-asset platform consisting of a diverse range of skills across portfolio management and global asset allocation research. Moreover, specialists may leverage on the sector expertise of Pioneer Investments' global equity and credit fundamental analysts to enhance security selection ideas in the portfolio.

The following case study illustrates how we aim to diversify risk effectively through the addition of a low correlated strategy to a sample multi-asset portfolio.

Case Study

We believe that the recent pick-up in bond yields could have an adverse impact also on diversified portfolios, given the recently positive cross-asset correlations. To assess the magnitude of losses, we stress tested the impact of rising yields on a sample multi-asset income portfolio. Given its focus on income, it is challenging to substantially reduce risk in this portfolio during risk-off periods. Instead of re-balancing risk into lower risk assets, where the yield potential is low, we thus aim to add low correlated strategies with the potential to dampen capital losses.

Step 1: Stress Testing the Risk From Rising Yields

To assess the impact of rising yields, we stress tested the impact of a bear steepening⁹ in U.S. and European yield curves. Despite the relatively conservative assumptions listed below, as seen in Chart 11, we estimate a significant portfolio loss of -1.44%¹⁰ from a bear steepening in EU and U.S. yield curves:

- U.S. and European (using German as a proxy) yields: 30 year maturities +80bps while short-term 5 Year maturities to a lesser extent by +40bps
- European Investment Grade: a benign scenario for spreads (-2bps) given the support from the ECB’s corporate bond purchase programme
- We used a low decay factor to give a higher weighting to recent data/observations (and hence more recent correlations)

Risk Group	Stress PnL
Equity	-69
Spreads	3
Foreign Exchange	-13
Rates	-42
Inflation	1
Volatility	1
SmartReval	-26
Total	-144

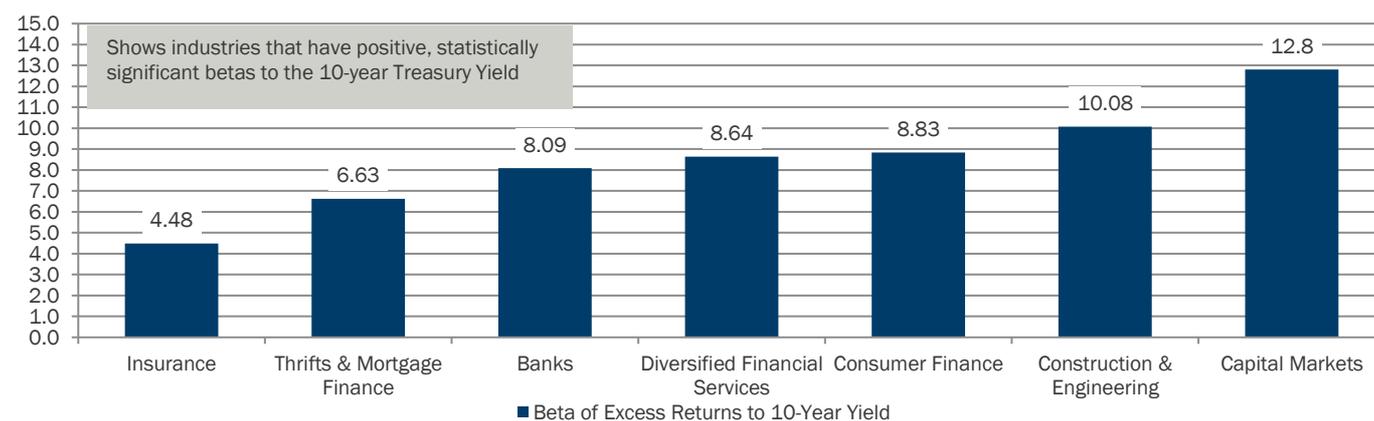
Source: Pioneer Investments using BlackRock Aladdin® Simulations. Data as at 20 October 2016. For Illustrative Purposes Only.

Although we were conservative in our assumptions, especially on European credit, we expect spreads to widen significantly given crowded investor positioning which has supported spreads thus far. However should these positions reverse, we expect the impact from spread widening to have more severe repercussions.

Step 2: Seeking an Uncorrelated Strategy with an Aim to Mitigate Risk

In an environment of rising yields, we believe that reflation trades, such as in the banking sector, should benefit. Valuations across the global banking sectors have been depressed due to the persistent low yield environment and flatter yield curves, which have compressed banks’ Net Interest Margins (the difference between the rates banks lend at and the rates they pay on deposits).

Chart 12: Banks can Potentially Add Low Correlated Returns in an Environment of Rising Yields



Source: NDR Multi-Cap Institutional (Universe), S&P Capital IQ and MSCI. Inc (GICS), Federal Reserve Board, S&P Dow Jones Indices. Data from 30 September 2011 to 31 August 2016.

⁹A bear steepening refers to a spread widening between long-term and short-term rates, with long-term rates increasing at a faster rate than short-term rates.

¹⁰Data refers to simulated past performance. Past performance is no guarantee of future performance.

The fundamental outlook on earnings was weak, resulting in low multiples. We believe that the expected environment of steeper yields should be positive for banking margins. The analysis from Ned Davis Research (Chart 12, previous page) supports our investment rationale by demonstrating that excess returns in industries such as Banks have statistically significant positive betas to U.S. 10-year Treasury yields over the past 5 years.

Step 3: Assessing the Impact of Adding an Uncorrelated Strategy

Given that valuations are most depressed on the European banking sector due to the added uncertainty on the loan books of banks in the peripheral markets, as well as other idiosyncratic risks, we believe a trade on European banks may be more interesting relative to their U.S. counterparts. Therefore, we simulated the impact on the income generating multi-asset portfolio of adding a 10% long allocation to EU banks (ex UK) using an index tracker. The risk assumptions remain unchanged from the previous analysis but now the impact has reduced by -44bps to -1.00% (Chart 12).

Please note that a 10% allocation to the banking sector is hypothetical and used for illustrative purposes only. In practice, the actual allocation should be significantly smaller and with disciplined draw-down management policies in place to mitigate potential losses.

Risk Group	Stress PnL
Equity	-32
Spreads	3
Foreign Exchange	-1
Rates	-42
Inflation	1
Volatility	1
SmartReval	-30
Total	-100

Source: Pioneer Investments using BlackRock Aladdin® Simulations. Data as at 20 October 2016. For Illustrative Purposes Only.

This strategy can be enhanced with an aim to build a pure alpha strategy. This involves correspondingly shorting the Eurostoxx Index to remove exposure to the beta risk of the European equity market. The resulting relative value strategy (long EU Banks versus short Eurostoxx 50 Index) could reduce the loss further by -20bps to -0.80%¹¹.

We used a passive index tracker to gain exposure to the EU banking sector to simplify the simulation. As we aim to be selective in stock picking to enhance the potential for alpha generation, we would typically gain exposure through a select number of bank stocks. This could potentially add more value as it may help reduce idiosyncratic risk given that there is a wide dispersion in the earnings potential among European banks.

Conclusion

Diversification against a backdrop of heightened uncertainty is challenging. This is particularly true when traditionally uncorrelated assets such as government bonds and equities begin to exhibit unidirectional price movements - an unintended consequence of excessively accommodative monetary policies of global central banks in our view.

If normalisation is now on the cards, as evident from recently rising yields, we believe that risks should be diversified effectively through an allocation to low correlated strategies to increase portfolio resilience. An independent process encouraging an independence in mind-set and risk taking can enhance the prospect of truly low correlated strategies.

We demonstrated that the addition of a low correlated strategy to a sample diversified multi-asset income portfolio could potentially help reduce the magnitude of losses from rising yields. While we used a passive index tracker to simulate the impact on portfolio performance, we believe that stock picking can add more value by reducing losses further as idiosyncratic risks within the European banking sector remain high.

¹¹ Data refers to simulated past performance. Past performance is not a guarantee of future performance.

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