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INVESTMENT MANAGEMENT

The Changing Investment Climate: Higher Correlation Risks as QE Benefits Fade

FIXED INCOME | INVESTMENT INSIGHTS | 2016

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Historically, the future expected value of an asset was primarily driven by economic fundamentals, with a smaller component coming from risk premia. Today, the opposite is true.

The reason for this change can be traced to quantitative easing (QE)—central bank policies that were designed to diminish economic fundamentals and lower risk premia in order to reflate asset prices. However, the long-term effects of these purchases have begun to fade and risk premia is dominating valuations. The unintended consequences are higher volatility, increased correlations and decreased value of risky assets. We refer to this change in the investment climate as QE policy attenuation, a new dynamic risk factor that investors need to account for in their asset allocation. This can be done by adding strategies that seek to reduce correlations risks.

In addition to *QE policy attenuation*, additional structural risk factors have risen from financial market regulation that has reduced liquidity and adversely impacted an economic transfer of risk. This promotes a rise in idiosyncratic uncertainties that increase the volatility of fixed income asset returns, which in turn creates anxiety for investors who expect bonds to be a more stable investment. We find that these structural risk factors compound and manifest in the risk premia component of an asset's valuation. Risk premia, once a small part of an asset's overall valuation, thus now has a larger influence on asset price changes. This presents a challenge to investors

KEY HIGHLIGHTS

As benefits from quantitative easing fade away, risk premia is playing a larger role in asset valuation than it has historically.

As a result, fixed income market performance has become more volatile, seemingly disconnected from economic fundamentals and therefore harder to explain.

The larger role of risk premia causes correlation risks to rise and reduces diversification, which creates unwanted risks for investors in a product that was expected to be a more stable part of their asset allocation.

We believe adding actively managed, unconstrained and opportunistic fixed income strategies can potentially reduce correlation risk and can add diversification* to an asset allocation.

* Diversification does not eliminate the risk of loss.

> "The extended period of QE may now have the unintended consequence of significantly reducing the fundamental component of an asset's valuation while leaving risk premia, the least understood part of an asset's valuation, to rise."
>
> —Jim Caron

as changes in risk premia are highly unpredictable, difficult to calculate and tend to have the characteristic of highly correlating asset prices.

We conclude that properly executed, actively managed, unconstrained and opportunistic fixed income strategies may be an effective way to help reduce correlation in an asset allocation. Note that we believe size still matters in terms of AUM (assets under management) to achieve this goal. It is a key determinant of success in our opinion, because if a manager is the "right size" to access the available liquidity in the market across a wide range of assets, he is more likely to reduce correlation and generate more consistent excess returns with a higher Sharpe ratio.

Addressing the Risk Premia Puzzle: The Dark Matter of Asset Valuations

A simple definition of risk premia is the additional compensation an investor requires over and above the return of a risk-free asset. Separately, when used in the context of a valuation for an asset's price, it is the additional component of return that is unexplained by economic fundamentals. Commonly, the expected future value of a fixed income asset is explained by fundamentals such as economic growth (GDP), inflation, the path of short-term interest rates, default risk, et al. Together, these fundamental factors help solve for a discount rate on future cashflows to determine a present value (PV) for the price of an asset. However, the actual price of the asset may deviate from the PV of the cashflows: most times the price is lower, which indicates a residual value, or risk premia, that an investor requires as compensation for taking on the risk of an investment. In academic literature, this is referred to as risk aversion. Risk premia is a puzzle because it fluctuates widely and varies outside of ranges that could otherwise be explained by fundamentals.[1,2] This is well-explained in academic literature that is beyond the scope of this paper, and we leave for the reader to explore independently.

For purposes of simplicity, we recognize risk premia as a residual component in an asset's valuation and express it this way:

Asset Value = Fundamental Component + Risk Premia (or Residual) Component

Risk premia, the dark matter of finance

If this seems murky, that's because it is. The fact is that many people value and calculate risk premia differently. Each way may be valid, but the results can vary widely. Some refer to assessing risk premia as a "dark art." Dark because it's mysterious and art because it's more of an art than a science. It is not unprecedented to place such a high weight on a quantity that cannot be observed directly. Astrophysicists, for example, hypothesize a quantity known as dark matter, which cannot be observed directly but is instead inferred by the gravitational effects it has on motions of visible matter. This is similar to the inferred effect risk premia has on an asset's price level and its variability. So, perhaps we can consider risk premia as the dark matter of finance!

High risk premia increases correlation risks

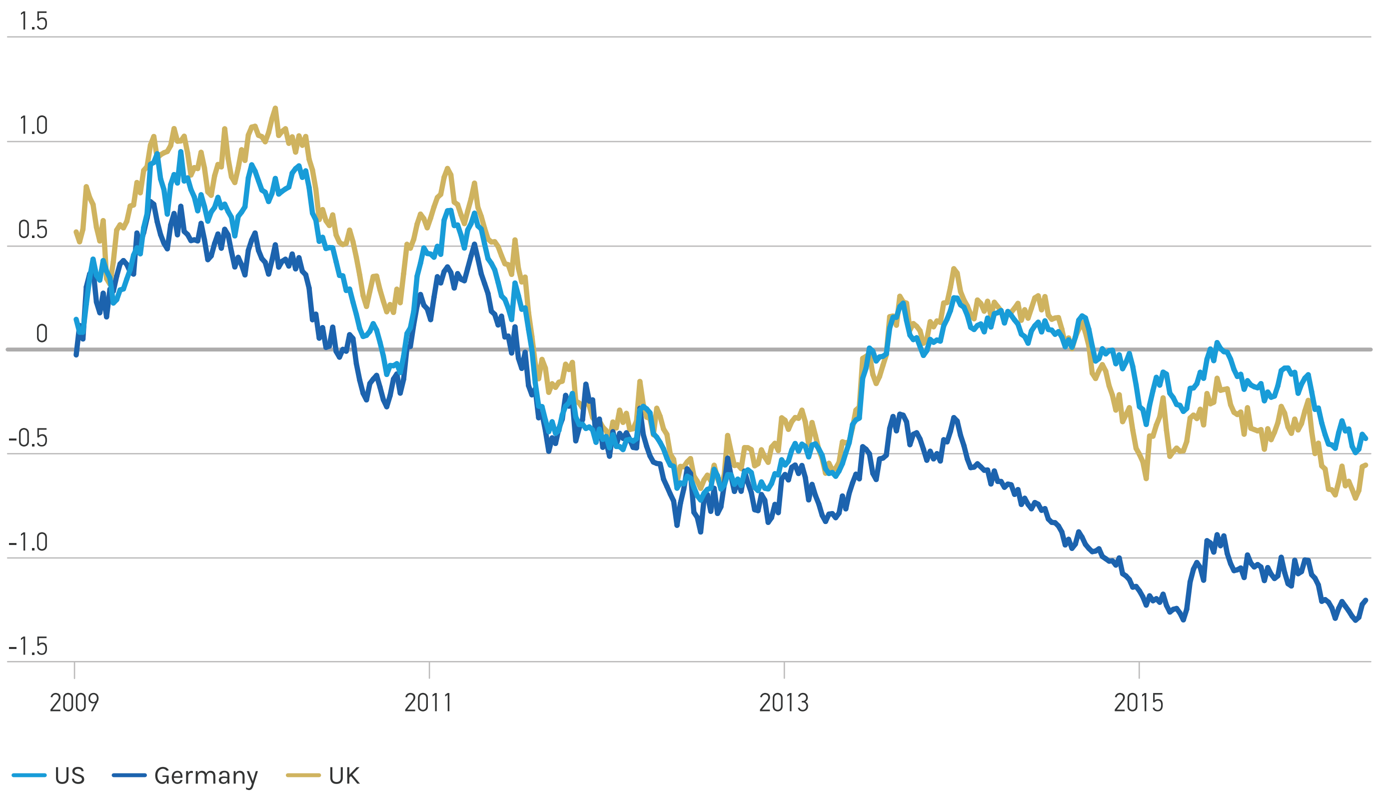
The significance of risk premia to market risk factors lies in its linkage to asset

[1] Mehra, Rajnish; Edward C. Prescott (1985). "The Equity Premium: A Puzzle". Journal of Monetary Economics 15 (2): 145–161.

[2] Robert Shiller, "Consumption, Asset Markets, and Macroeconomic Fluctuations," Carnegie Rochester Conference Series on Public Policy 17 203-238.

DISPLAY 1

QE policies reduced term premia to decrease yields by an amount greater than what fundamentals would otherwise suggest



Source: Kim, D. and Jonathan Wright. "An Arbitrage-Free Three-Factor Term Structure Model and the Recent Behavior of Long-Term Yields and Distant-Horizon Forward Rates", 2005. Morgan Stanley Investment Management, Haver Analytics, Blue Chip Forecasts. Data as of May 6, 2016. Provided for illustrative purposes only and is not meant to depict the performance of a specific investment. **Past performance is no guarantee of future results.**

correlations. The financial community agrees that risk premia exists and tends to agree on whether it is rising or falling but cannot agree on how to precisely measure it, other than to monitor the impact it has on observable fluctuations in asset prices. The commonality of measuring risk-premia-based observable price fluctuations is a characteristic factor that creates a high correlation between asset prices and changes in risk premia.

This linkage between risk premia and correlation has become especially pronounced as a result of central bank QE policies that were designed to inflate asset prices by reducing risk premia. An example of this can be seen in *Display 1*, which shows how term premia, a measure of risk premia for sovereign bonds, were pushed lower and even into negative territory, in order to keep risk-free rates lower than they otherwise would have been. The extended period of QE may now have the unintended consequence of significantly reducing the fundamental component of an asset's valuation while leaving risk premia, the least understood part of an asset's valuation, to rise. Thus, asset price moves become more explained by changes in perception of risk premia than by fundamentals. This means that the least understood part of an asset's valuation is explaining a major part of an asset's movement in price. Today, investors are challenged to solve this puzzle.

The Evolution of Risk: From Systematic to Idiosyncratic, From Linear to Nonlinear

Market risks are evolving differently in this period of *QE policy attenuation*, and this difference needs to be calibrated in portfolio construction. Although there are many risk factors in the market, we will focus on the two we believe are disproportionately impacting risk premia for fixed income assets and thereby increasing correlation. The first is a shift from systematic risk factors dominating asset performance to idiosyncratic factors. We wrote about this in our December *Insights* publication titled, *Looking Ahead at 2016: A Market of Many*. The second is a view we put forth in our May *Insights* publication titled, *Defeat Volatility, Increase Holding Period*, where we discussed how market risk is evolving nonlinearly instead of linearly, which is changing how people may commonly consider risk.

In this section of the paper, we would like to discuss each of these factors, and describe how we weight and incorporate them into our portfolios construction process.

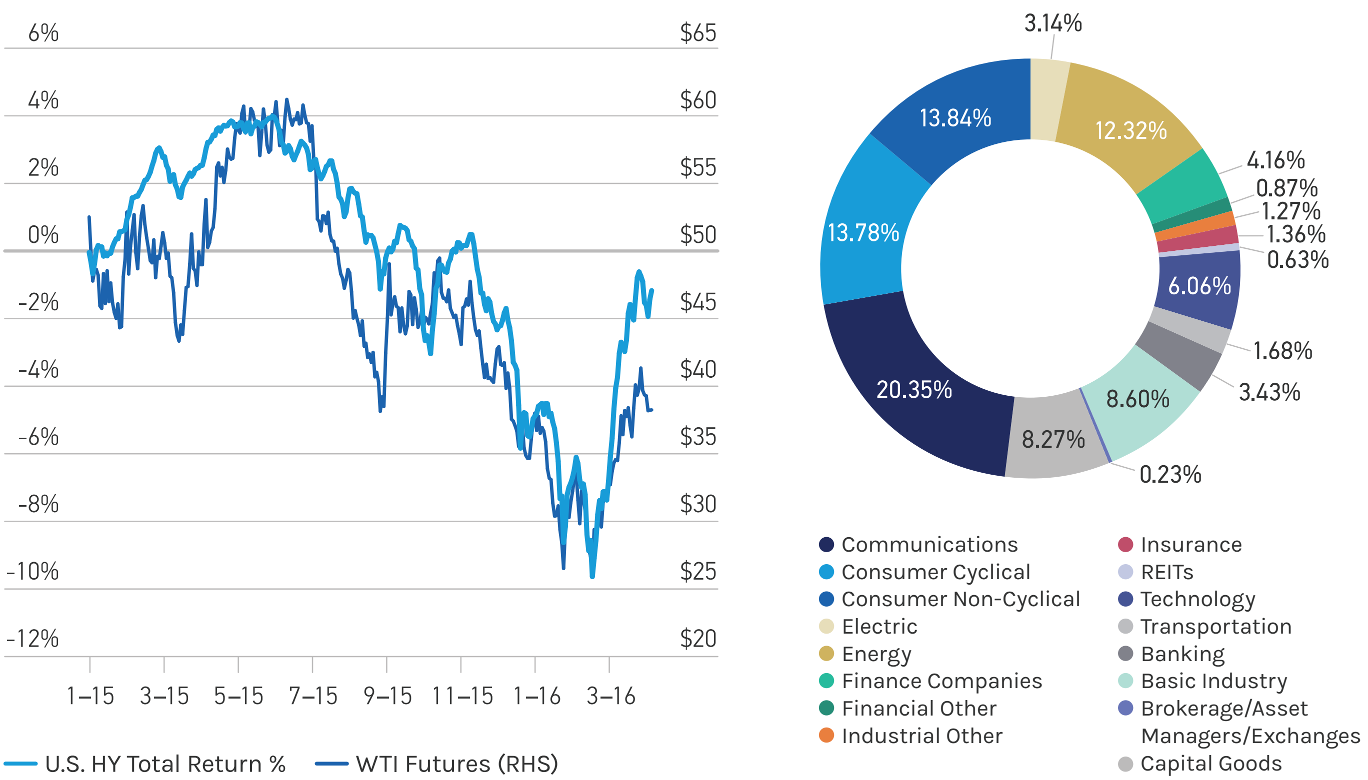
Rise of idiosyncratic investment risk

Pockets of risk in small segments of the market are heavily influencing levels of risk and are having a disproportionately large impact on broad market performance. Due to the bifurcation of economic and monetary policy cycles globally, we do not believe broad index returns, which typically reflect systematic risk, will be representative of actual return potential. There is likely to be a wide disparity between the best and worst performing sectors of the fixed income market that may ultimately be masked by the overall index. We think this wide disparity of returns will create many idiosyncratic investment opportunities across the market, or what we refer to as a *"market of many."* But it also increases risk premia and creates correlation risks.

DISPLAY 2

Idiosyncratic factors driving high correlations across assets: Where oil has gone, high yield has gone

Data as of March 31, 2016



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Source: Barclays

We do not have to go too far back in history to provide examples of a rise in idiosyncratic risk factors that had a disproportionately large impact on rising risk premia: China's currency devaluation in 3Q15 and the subsequent energy sector performance are clear recent examples. For instance, the underperformance and significant spread widening in the U.S. high yield energy sector, which only represents 12% of the asset class, had significant spillover effects not only broadly across high yield but also across other asset classes, such as investment grade credit, securitized assets and equities. One can also observe how the rise in risk premia, driven by the fall in energy prices, was highly correlated to the returns of the entire high yield index (*Display 2*). This idiosyncratic event triggered a rise in risk premia that created a broad rise in correlations across bonds and stocks.

A rise in idiosyncratic risks has important implications to asset valuations that extend beyond its impact on risk premia and into real economic activity. Our views on this are informed by a paper written by the Federal Reserve Board in 2014, titled, *Idiosyncratic Investment Risk and the Business Cycle*. It concludes that regulations resulting in lower liquidity (i.e., imperfect risk sharing) and aggregate shocks to uncertainty about idiosyncratic returns on investment led to an uneconomic transfer of risk and thus contractions with elevated risk premia and a decrease in the risk-free rate. In addition, with an idiosyncratic uncertainty shock, investment in physical capital can remain low, which helps explain why capital expenditure data has been persistently weak, even after the stock market recovery. Thus, shocks to idiosyncratic investment risk can explain, qualitatively, the aftermath of financial panics—elevated risk premia, a sharp and persistent decrease in investment, and a decrease in the risk-free rate.[3]

Another factor to consider is the impact idiosyncratic uncertainty has on the variability of discount rates. Recall earlier that we described an asset's valuation as the sum of a fundamental component and a risk premia component. The fundamental component of the valuation is the PV of the cashflows from an asset. In order to calculate the PV, one needs a discount rate to apply to the cashflows.[4] When idiosyncratic uncertainty is high, the uncertainty, or variability, of the discount rate is also high. As a result, the derivation of the present value of an asset based on fundamentals is weakened. Said differently, fundamentals explain a lower portion of an asset's valuation. This means that risk premia ends up explaining a much higher portion of an asset's valuation.

There is a well-known condition in academic circles that arises during a weak correlation between asset returns and measurable fundamentals referred to as the *asset-pricing puzzle*. A central finding of modern empirical finance is that the variation in asset returns is overwhelmingly due to variation in discount factors.[5] This underscores the importance of the communication of short-term policy rates by central banks and the profound role they play in the performance of asset prices, which is commonly referred to as financial conditions.

Nonlinear evolution of risk

Returns for fixed income assets have become more volatile over the past year, which is creating anxiety for investors because bonds are expected to be a more stable investment. The factors driving this current dynamic, such as regulation, liquidity and the *attenuation of QE policies* may represent a structural change in the evolution of returns and how bond investors need to think about risk. Volatility, a measure of the dispersion of returns in relation to time, has, therefore, become more nonlinear. Thus, a longer holding period is not necessarily proportional to higher risk, which represents a change in how some may commonly consider risk. This nonlinearity needs to be incorporated into our decision-making process when considering the holding period of an investment.

We developed this thesis in our *Insights* publication in May 2016. Volatility and risk are commonly used interchangeably in the market but are often misunderstood. For purposes of this discussion, where we assert that a structural change has occurred in how prices change over time, we feel it necessary to review some basic concepts of volatility so that our conclusion can be better understood.

Mathematically, volatility is derived from the following equation using variance (σ^2) and time (T).

$$\sigma_T^2 = \sigma^2 T \text{ (Equation 1)}$$

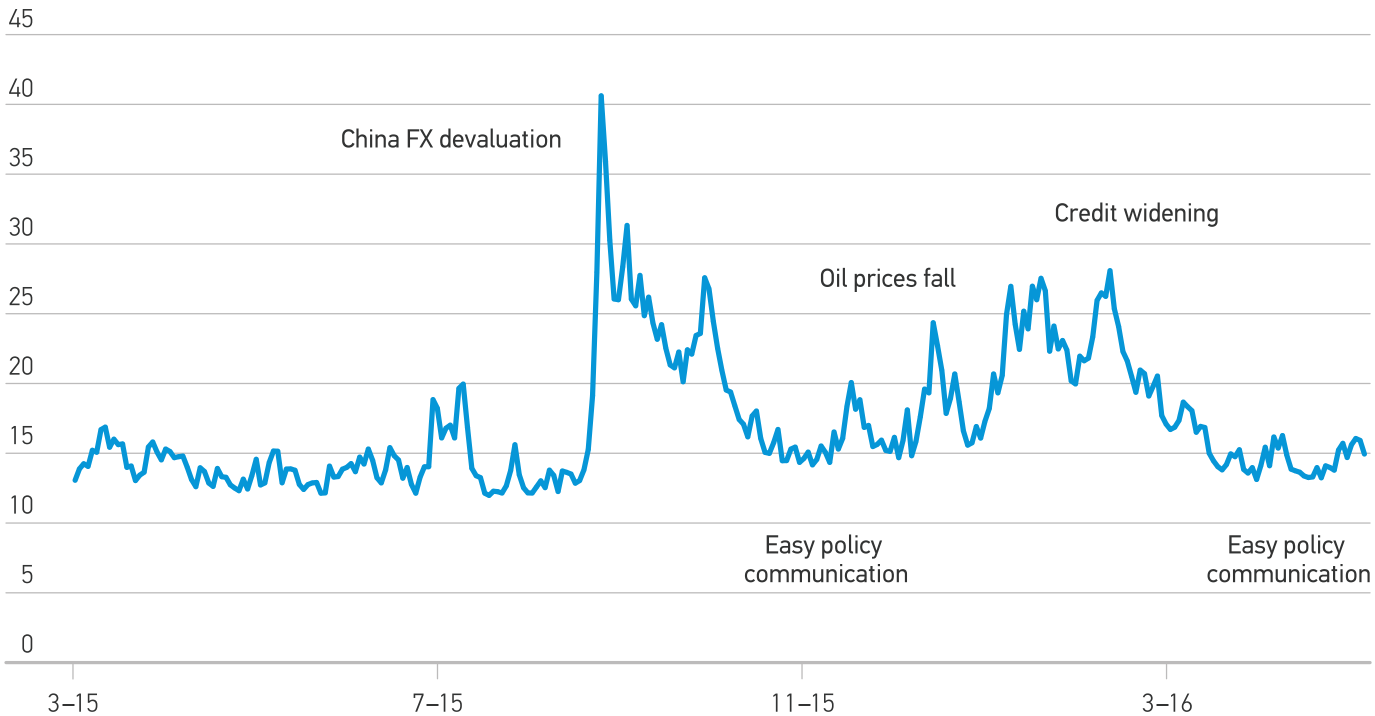
[3] Idiosyncratic Investment Risk and Business Cycles; Jonathan Goldberg. 2014-05. Finance and Economic Discussion Series, Division of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington D.C.

[4] Present Value is the value of an expected income stream, or cashflow, determined as of the date of valuation. Mathematically it is represented as PV = Future Value/(1+i)n where i is the discount rate.

[5] Valuation Risk and Asset Pricing, Albuquerque, Eichenbaum, Luo and Rebelo, December 2015. Federal Reserve Board of Chicago.

DISPLAY 3

VIX Index: Clustering of volatility followed by periods of calm indicates that risk is evolving in a nonlinear pattern



The index performance is provided for illustrative purposes only and is not meant to depict the performance of a specific investment. **Past performance is no guarantee of future results.**

Note: The VIX index is a volatility index, which shows the market's expectation of 30-day volatility. It is constructed using the implied volatilities of a wide range of S&P 500 Index options.

Source: Bloomberg, Morgan Stanley Investment Management. Data as of May 6, 2016.

For mathematical convenience, we approximate that asset returns follow a random walk whose variance increases linearly with time. This is because we assume the random returns form a normal distribution in which the mean and the variance both scale with the number of returns (i.e., time). An important concept to note, which we will refer to later, is that time is a scaling factor when defining risk or volatility.

Therefore, when the evolution of asset returns over time is commonly described as volatility, the following is likely being implemented: i) observing a change in an asset's return over a discrete period of time; ii) measuring that change (positive or negative) as a square of the distance from the mean (i.e., variance), to avoid negative numbers so it can be summed; and iii) taking the square root of the measure of variance so that volatility and risk can be expressed in units of standard deviation, which is conceptually more convenient for us than expressing market price moves in terms of squares. The expression for volatility, therefore, becomes

$$\sigma_T = \sigma \sqrt{T} \text{ (Equation 2)}$$

What we describe above is an approximation of how we expect changes in asset returns to evolve over time so that one can make an approximate measure of the risk associated with an investment. Under ordinary market circumstances, this linear calculation of risk was sufficient.

Today, however, when taking into consideration the regulatory environment that adversely impacts liquidity and the influence that central bank activity has on distorting prices, conditions are anything but ordinary—they are extraordinary! The consequence is that price discovery over time, or our concept of volatility and risk, has also become distorted. As a result, we need to adapt and to adjust.

We use the VIX index in *Display 3* as a proxy observation of volatility for risky assets. Over the past twelve months, in what looks like a series of volatile episodes, or a clustering of volatility akin to a rolling crisis only interrupted by central bank activity, we can see that risk has shifted from linear (Equation 1) to non-linear (Equation 3).

As prices are not evolving in a normal manner, we need to adjust our standard calculation of volatility (risk) and adapt it to the current environment. This will be necessary in order to construct more durable portfolios that can produce higher but less volatile returns (Equation 3).

As we think about portfolio construction, we return to a common theme that we have written about in previous Insight publications: risk premia. We think of risk premia as the error term, or residual, in our calculation of an asset's value—the part of an asset's value that goes unexplained by fundamentals. Our current investment thesis is that changes in risk premia explain an asset's value more than changes in fundamentals.

We apply this same thesis to our understanding of volatility and risk; it is the error factor, or residual, that explains changes in volatility and risk. Conceptually, we borrow from results derived from autoregressive conditional heteroskedasticity (ARCH) models that we believe better represent market risk today because they place a greater weight on the error term, or what we would refer to as a risk premia, when assessing volatility or risk. The result is that volatility takes on the generalized form of a polynomial, thus a nonlinear expression of risk:

$$\sigma_T^2 = \omega + \beta(L)\, \sigma^2_{t-1} + \alpha(L)\eta^2_t$$
(Equation 3)

ω is a constant, $\beta(L)$ is the autoregressive term, $\alpha(L)$ is the lag operator on the innovation of the asset return (η_t), a moving average term. We encourage the reader to refer to the source references for a more detailed explanation.[6]

ARCH models are commonly employed in modeling financial time series that exhibit time-varying volatility clustering—i.e., periods of swings interspersed with periods of relative calm—like we observe in *Display 3*. The error terms, what we refer to as risk premia, are thought to have a characteristic size or variance related by a nonlinear function. In particular, ARCH models assume the variance of the current error term to be a function of the actual sizes of the previous time periods' error terms.[7] Said differently, ARCH models are expected to be better at handling correlated risks. This is an important feature in the current market environment where volatility comes in clusters and idiosyncratic events are driving a high degree of correlation across asset returns.

Conclusion

Risk premia plays a larger part of an asset's valuation than it has in the past, which must be taken into account when constructing a portfolio or creating an asset allocation. It tends to increase correlation risks and therefore increase the volatility of fixed income returns. In this report, we describe the underlying reasons why risk premia has taken on such a prominent role: an attenuation of QE policy, an increase in idiosyncratic uncertainty that leads to higher variability in discount rates and subsequently the evolution of nonlinear risk. All together, these factors present a challenge in the form of higher correlation risks in portfolios for investors.

We believe that investors need to seek fixed income strategies that help reduce correlation and become a diversifying agent in their asset allocation mix. This will help investors overcome the challenge of rising correlation risks brought on by the greater influence risk premia has on asset prices. We find that selecting properly managed, unconstrained, active and opportunistic fixed income strategies, which are "right-sized" in terms of AUM, and can execute within the confines of the available liquidity in the market across a wide selection of assets, can provide a solution to help reduce correlation risk and add diversification and return potential to one's overall asset allocation.

[6] Introduction to Arch & Garch Models, University of Illinois, Roberto Perrelli, Fall 2001.

[7] Engle, Robert F. (1982). "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation". Econometrica 50 (4): 987–1007.

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