



LDI Implementation— Managing Surplus Volatility by Reducing the Drawdown Risk of Growth Assets

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In brief

- Market and regulatory events are challenging corporate pension plans to find innovative ways to manage drawdown risk and improve the health of their plans.
- To achieve these goals, plan sponsors need to optimize the trade-off between funded status and surplus volatility, a challenge historically addressed within hedging assets.
- We suggest that plan sponsors should also analyze their growth assets for ways to reduce surplus volatility while still seeking long term returns.
- QMA's US Market Participation Strategy (MPS)—with its asymmetric return profile and low correlation to other growth assets demonstrated over a 24-year track record—can help plans manage surplus volatility by reducing drawdown risk while providing attractive returns.*

"The enemy of the conventional wisdom is not ideas but the march of events."

- John Kenneth Galbraith, *The Affluent Society*¹

Even the most carefully designed pension plans may falter when the march of events conspires against them. For plan sponsors, such a confluence of events included the Pension Protection Act of 2006, the Global Financial Crisis in 2007-09, and successive rounds of Quantitative Easing in 2011-13. What's more, participants are living longer and updated actuarial tables have made the task even more challenging. It's no wonder the funded status of many corporate pension plans is under such strain. With the current low interest rate environment keeping liabilities high, corporate treasurers are looking for ways to optimize the trade-off between funded status and surplus volatility. While conventional wisdom for liability-driven investing (LDI) would seek risk-reduction solutions only within the hedging bucket, we suggest a complementary approach that includes analyzing growth assets as well.

GROWTH ASSETS AND DRAWDOWN RISK

When corporate plan sponsors implement an LDI strategy, taking into account both plan liabilities and assets, their definition of risk changes from standard deviation of asset returns to pension

surplus volatility. As a result, plan sponsors face a multidimensional puzzle—how best to earn attractive asset returns within their growth bucket, achieve sufficient duration-matched returns in their hedging bucket, and successfully manage the interaction and volatility between the two.² Plan sponsors have tended to focus their attention on hedging assets. But with the average LDI funded ratio hovering at only 80%, plan sponsors also need attractive risk-adjusted returns from growth assets in order to narrow funding gaps and minimize current and future contributions. The purpose of the growth bucket is to provide attractive long-term returns that can move the pension plan toward fully funded status. While traditional growth assets hold out the promise for higher returns, they also introduce the risk of large drawdowns, which can push funded ratios even lower, perhaps triggering unexpected contributions. For that reason, a growth asset that reduces drawdown risk but also generates attractive returns can be a valuable tool in minimizing surplus volatility.

STRATEGIES FOR REDUCING DRAWDOWN RISK

Several types of strategies are available to investors seeking to reduce drawdown risk while retaining exposure to upside participation in equity market returns. These strategies include:

- Low Volatility/Defensive equity strategies (long positions in historically low beta stocks).
- Buy/Write option strategies (earn option-writing income to offset potential losses in down markets).
- Structured products (long-dated call options combined with US Treasuries in an actively managed portfolio) that provide upside participation with downside protection, a prime example being QMA's Market Participation Strategy (MPS).

These strategies vary in how well they protect on the downside, depending on the extent of the drawdown and market conditions. However, when evaluating them, it's helpful to keep in mind that the primary reason a plan sponsor would adopt them over traditional growth assets is protection against large market drawdowns.

We can compare the strategies on that basis by looking at the two bear markets over the last 20 years when the S&P 500 Index declined more than 20%. 1) from August 2000 to September 2002, when the S&P 500 Index declined 44.7% as the Tech Bubble burst; and 2) from October 2007 to February 2009 when the S&P 500 dropped by more than half (50.9%) during the Global Financial Crisis.

*Past performance is not a guarantee or reliable indicator of future results. There is no guarantee this objective will be achieved.

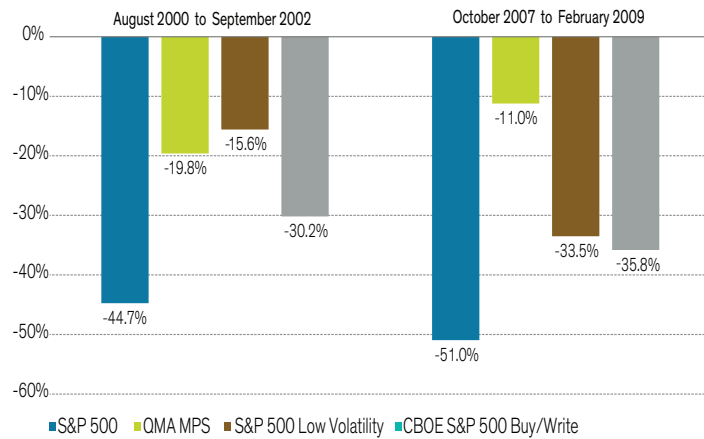
¹Galbraith, John K. *The Affluent Society, The Concept of the Conventional Wisdom*. Chapter 2, Section IV, pg. 21. Boston: Houghton Mifflin, 1958. Print.

²Leibowitz, Martin L., and Roy D. Henriksson. 1988 "Portfolio Optimization Within a Surplus Framework." *Financial Analysts Journal* 44 (March/April): 43-51.



Figure 1 shows that MPS delivered low drawdowns in each of these major market declines. The difference was especially dramatic in the Global Financial Crisis, when MPS's drawdown was less than a third of the drawdown for Low Volatility/Defensive and Buy/Write. To the extent that a plan sponsor wants above all else to avoid a repeat of 2007-09, MPS would thus appear to be an attractive choice for smoothing out funding status volatility.

1/ COMPARISON OF MAX DRAWDOWNS DURING BEAR MARKETS (S&P 500 DECLINING MORE THAN 20%)



Source: QMA, Standard & Poor's. Please see notes to disclosure for important disclosures. Subject to change.

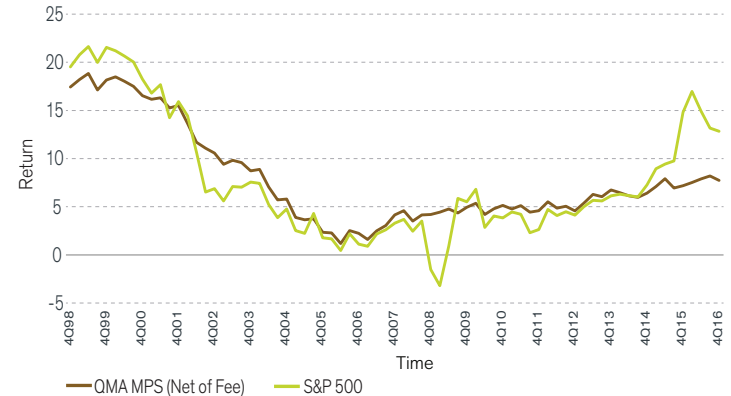
MPS AND UPSIDE PARTICIPATION

While it's evident that MPS has reduced drawdowns over its 24-year track record, it also provides upside participation. A good rule of thumb is that MPS participates in about two-thirds of the market upside and about 30% of the downside of the S&P 500 Index through a full seven-year market cycle. Over extended periods, this combination of reduced max drawdown and significant upside capture has provided annualized returns in line with the S&P 500 Index—but with less volatility.

Figure 2 shows seven-year rolling returns for both the S&P 500 Index and MPS, starting with the inception of MPS in 1992. Over most time periods, there is a remarkable similarity in rolling returns between MPS and the S&P 500 Index; however, notable periods of outperformance include the Global Financial Crisis as well as the most recent bull market.

2/ MPS HAS PERFORMED IN LINE WITH THE S&P 500

Rolling 7-Year Returns

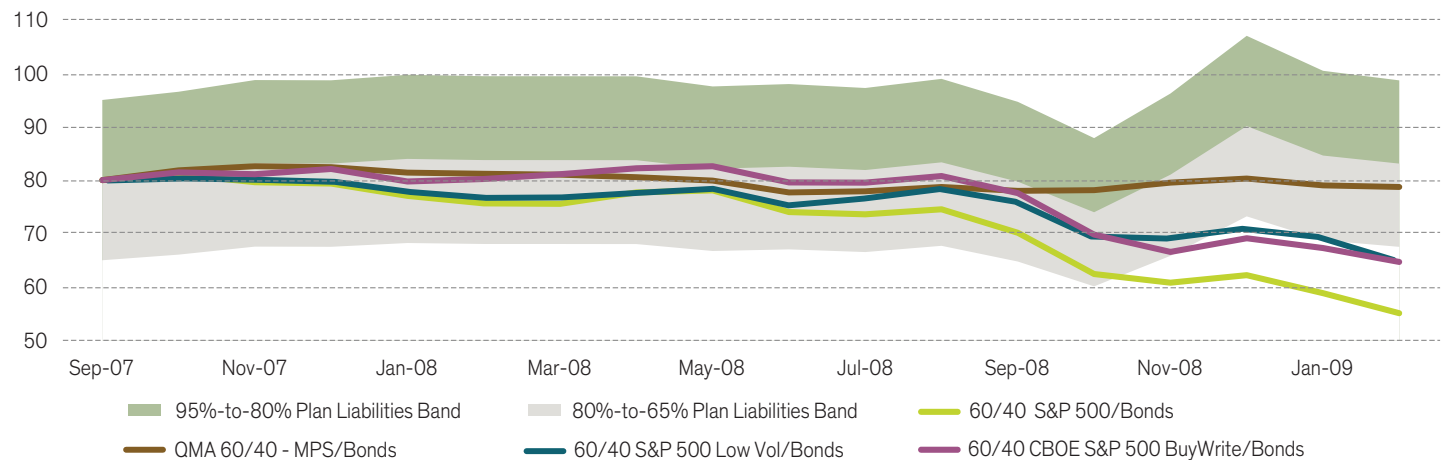


1/1/1992—12/31/2016 (28-Quarter Moving Windows, Computed Quarterly). Source: QMA, eVestment Alliance. Shown for illustrative purposes only. Please see notes to disclosure for important disclosures. Past performance is not a guarantee or a reliable indicator of future results. An investment cannot be made directly in an index.

FUNDED STATUS VOLATILITY DURING TIMES OF MARKET DISTRESS

To better understand how the volatility of growth assets can affect funded status, we again looked at the bear market decline during the Global Financial Crisis, from October 2007 to February 2009. Figure 3 shows the impact on a sample plan's funded status from changes in the value of its portfolio if it only held one growth asset and one hedging asset in a 60%/40% combination. The chart compares a 60/40 combination of the S&P 500 Index and the Barclays US Aggregate Index to three similar 60/40 asset

3/ IMPACT OF GROWTH ASSETS ON A SAMPLE PLAN'S FUNDED STATUS DURING THE GLOBAL FINANCIAL CRISIS



10/1/2007—2/28/2009.

Source: QMA, eVestment Alliance, Barclays.

The above chart compares the historical change in funded status if a plan invested its growth assets entirely in the S&P 500 Index, QMA's Market Participation Strategy (MPS), S&P 500 Low Volatility Index, or CBOE S&P 500 Buy/Write Index, relative to the change in its liabilities for the period. Each of these growth assets was combined with a hedging bond allocation to construct a simple 60% growth and 40% hedging plan asset allocation. All four asset allocations assume an initial funded status of 80% and are rebalanced quarterly. Shown for informational purposes only. Bonds are represented by the Barclays US Aggregate Index. Plan liabilities are represented by the Barclays US Long Government/Credit Index, and are shown as 15% bands around an initial 80% funded status. Please note the QMA MPS is net of fee. Please see notes to disclosure for important disclosures. Past performance is not a guarantee or a reliable indicator of future results. An investment cannot be made directly in an index.

allocations that replace the S&P 500 Index with the drawdown reduction strategies discussed earlier—the Low Volatility/Defensive strategy, the Buy/Write options strategy, and QMA's MPS. To place the analysis within an LDI framework, we assumed the plan had an initial funded status of 80% at the beginning of October 2007. The plan's liabilities are represented by the Barclays US Long Government/Credit Index and are shown in the chart as 15% bands around 80% funded status.

As the chart shows, the portfolio with an MPS allocation performed best relative to the other growth assets in protecting funded status and minimizing surplus volatility during this period. In fact, the funded status of the portfolio with MPS never dropped below 77% funded during the Global Financial Crisis.

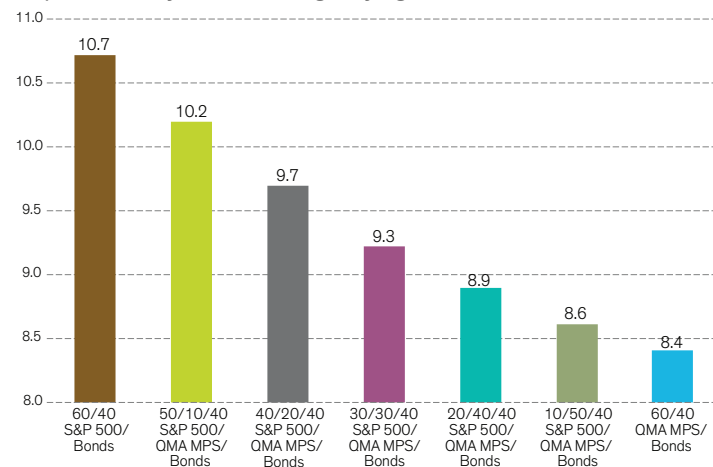
In contrast, the Low Volatility/Defensive and Buy/Write alternatives took funded status to below 65% by February 2009. Doing nothing to address drawdown risk was the worst choice: funded status with growth assets invested in the S&P 500 Index dropped from 80% to 55% in this 18-month period.

A CASE STUDY

So, in practice, how might a plan sponsor use MPS to lower the surplus volatility of its pension plan? Using the past 20 years of historical data, we tested whether MPS could help reduce surplus volatility when compared to a 60% S&P 500/40% Barclays US Aggregate Index portfolio by substituting the S&P 500 equity allocation with QMA's MPS strategy in 10% increments. As Figure 4 shows, surplus volatility would have decreased in proportion to the level at which MPS had been used as a complement to these other assets over the 20-year period.

4/ MPS HELPS LOWER FUNDED SURPLUS VOLATILITY

Surplus Volatility When Holding Varying Amounts of MPS



As of 12/31/2016.

Source: QMA, eVestment Alliance, Barclays.

The above chart illustrates the impact on Surplus Volatility when holding different amounts of the S&P 500 Index and QMA's Market Participation Strategy (MPS) within the growth asset portion of a 60% growth and 40% hedging assets plan portfolio. Shown for informational purposes only. Bonds represent hedging assets and are the Barclays US Aggregate Index. Surplus Volatility is calculated using the Barclays US Long Government/Credit Index to represent liabilities. Please note the QMA MPS is net of fee. Please see notes to disclosure for important disclosures. Past performance is not a guarantee or a reliable indicator of future results. An investment cannot be made directly in an index.

HOW DOES MPS WORK?

QMA's Market Participation Strategy is a unique defensive equity product which seeks to provide upside participation when the US market advances, while reducing downside risk. In essence, it is a customizable, non-publicly-traded structured product that invests primarily in long-dated (normally between 3- and 5-year maturity) S&P 500 Index "FLEX" call options and US Treasury bonds.

The S&P 500 FLEX options allow us to attain equity exposure with a lower expenditure of capital and harness those savings to buy downside protection with bonds. The flexibility provided by using long-dated options is important, but so is our experience understanding how these options react to changes in the markets, volatility, interest rates, etc. Our tactical use of these options is guided by over 20 years of experience in designing and managing these instruments within MPS.

We choose to use US Treasuries and cash as our primary downside risk protection, since exposure to US Treasuries provides a natural hedge in times of equity market dislocations. We hold multiple securities to manage duration and provide a strong combination of safety, yield and diversification while seeking to obtain the strategy's long-term objectives.

MPS normally targets an average options-based equity exposure of 60%. Many factors influence how options and bonds react to changing market conditions, and our ability to adjust equity market exposure based on QMA's asset allocation outlook has been an effective component to the portfolio strategy.

The blend of long-dated S&P 500 FLEX call options and US Treasuries used in MPS provides the framework upon which QMA's tactical management adds value. It's the understanding and structuring of the FLEX options, combined with the ability to dynamically modify exposures to both asset classes, that are ultimately instrumental in delivering attractive risk-adjusted returns.

CONCLUSION

The march of events, some expected and others not, poses extraordinary challenges to plan sponsors as they attempt to improve funded status while minimizing surplus volatility. Drawdown risk is perhaps the most important of these challenges, since major market declines greatly impact funded status—and it can take a plan years to recover. QMA's Market Participation Strategy provides an effective tool for addressing drawdown risk and protecting funded status. By incorporating MPS in their growth assets bucket, plan sponsors can optimize the trade-off between improving funded status during normal markets and minimizing surplus volatility during equity bear markets.

For more information

To learn more about QMA's asset allocation capabilities, please contact Stephen Brundage, Managing Director and Product Specialist, at Stephen.Brundage@qmassociates.com or 973.367.4591.

About QMA

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*As of 12/31/2016.

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CBOE S&P 500 BuyWrite Index (BXM) is a benchmark index developed by CBOE and Standard & Poor's to track the performance of a hypothetical buy-write strategy on the S&P 500 Index. The S&P 500 Buy-Write strategy involves buying the entire stock portfolio covered by the S&P 500 Index and selling equivalent number of near-term slightly out-of-the-money S&P 500 index call options on a monthly basis.

S&P 500 Low Volatility Index measures performance of the 100 least volatile stocks in the S&P 500. The index benchmarks low volatility or low variance strategies for the U.S. stock market. Constituents are weighted relative to the inverse of their corresponding volatility, with the least volatile stocks receiving the highest weights.

Barclays US Aggregate Bond Index is composed of U.S. investment-grade fixed-rate bond market, including government and credit securities, agency mortgage pass-through securities, asset-backed securities, and commercial mortgage-based securities with maturities of at least one year. Source of the Barclays US Aggregate Bond Index: Barclays.

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