



## Solutions to Six Investment Risks and the Role of a Central Exposure Manager

By

Jamie Cashman, CFA  
Global Head of Marketing

Keith Eiger  
Product Strategist

Jay Kwon, CFA  
Portfolio Manager

Given the dire funded status of many pensions or the troubled liquidity profiles of many endowments or foundations, now more than ever, there is an emphasis on meeting the required rate of return in a risk-efficient manner. A wide range of innovative investment strategies — well beyond the traditional 60/40 equity-bond allocation — are being considered by plan sponsors. In many cases, as part of these strategies, derivatives have been an important tool to, among other objectives, synthetically lengthen plan duration or to free capital to be deployed elsewhere. In any case, a “reach for return” should be considered in the context of trade-offs, and investors are often confronted with a broad spectrum of risks. Below we focus on six specific dimensions of portfolio risk and conclude that for each challenge a centralized “exposure” or “beta manager” who specializes in risk management and the efficient implementation of a derivatives program may be an important strategic partner for investors going forward.

### Risk #1: Surplus Risk

#### **The Challenge:**

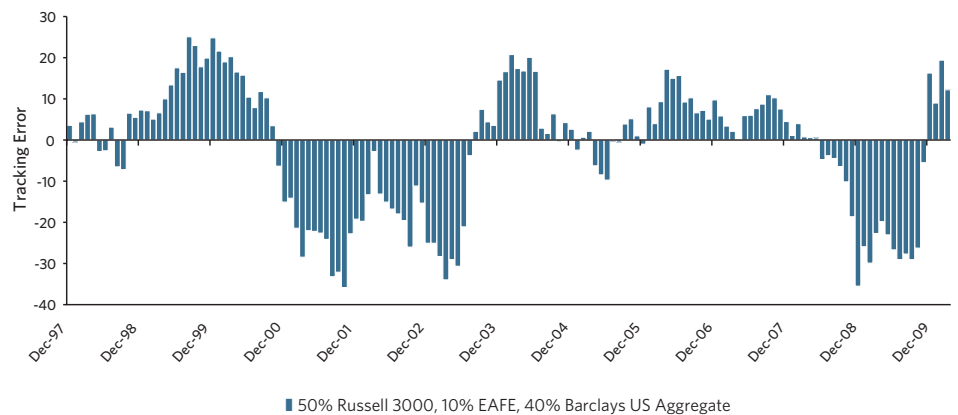
Even before the onset of the crisis, in reaction to a tide of legislative initiatives, an increasing number of corporate defined benefit plans around the world had begun to implement Liability Driven Investing (LDI) strategies in order to reduce mismatches between pension assets and liabilities — also known as managing surplus risk. While LDI is not a uniform, cookie-cutter approach, typically the principal objective is to reduce the surplus volatility — the tracking error of pension assets to liabilities. As Exhibit 1 illustrates, this tracking error can often behave quite erratically as assets and interest rates move in different directions and with different magnitudes during any given period.

In the past, many sponsors seemed resigned to bearing extreme surplus volatility. However, particularly since the “perfect storm” of 2001-2003 where both assets and discount rates fell precipitously and plan funded status fell dramatically followed by the “Great Recession” which began in late 2007, there has been renewed interest in measures to better match assets with liabilities.

## Exhibit 1 - Asset vs. Liability Returns

Here, a representative asset portfolio's return is compared against the return of the BNY Mellon Pension Services' monthly liability index.

As one can see, tracking error can behave quite erratically as assets and interest rates move in different directions and with different magnitudes during any given period.



Data Source: BNY Mellon Asset Management, BNY Mellon Pension Services. Please refer to index disclosures at end.

Changes around the globe in pension accounting have prompted many corporate defined benefit plans to cite “controlling funded status” as their number one priority.

As recently as the second quarter of 2010, a combination of U.S. stock market declines and lower interest rates resulted in the lowest-funded status for the typical U.S. corporate pension plan since the depth of the crisis.<sup>1</sup> Changes around the globe in pension accounting have prompted many corporate defined benefit plans to cite “controlling funded status” as their number one priority.<sup>2</sup>

### A Synthetic Solution:

Because the Aa corporate bond universe is not sufficiently large to satisfy every plan sponsor looking to hedge the plan's liabilities by going long a portfolio of bonds, frequently derivative overlays are used to obtain synthetic exposures to the risk factors of the plan's custom benchmark. Plans may implement dollar duration matching strategies to approximate a larger share of the interest rate risk which generally dominates the majority of fixed income beta risk in order to align assets with the plan's bond-like liability profile.<sup>3</sup> For example, a plan sponsor with a liability duration of 20 years and a 50% allocation to bonds with an asset duration of 10 years could extend the asset duration to 20 years by using long-term interest rate swaps or Treasury futures. Although the fixed income allocation would then be roughly twice as sensitive to interest rate risks, at the plan level the portfolio would have better approximated its liability duration. Such a strategy would also allow the sponsor to maintain policy allocation to fixed income and to direct capital towards potentially higher yielding asset classes. At the same time, however, the Plan would need to reserve sufficient liquidity in a collateral pool in order to service the overlay. Many investors allocate about 15% of the interest rate swap notional to a position in short-term Treasury bills to accomplish this.

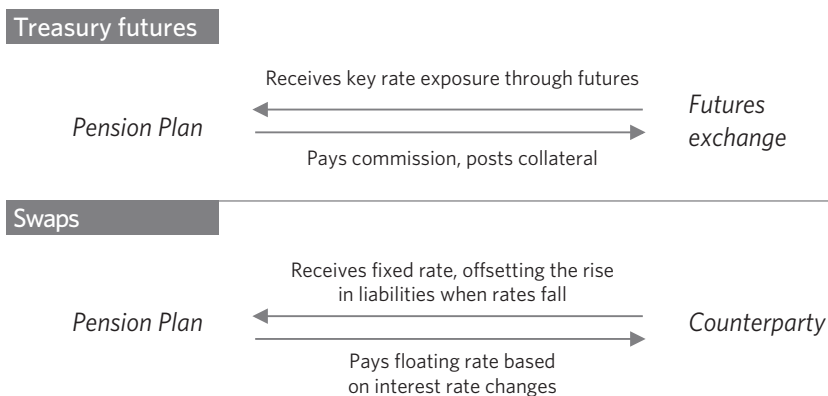
1 According to monthly statistics published by BNY Mellon Pension Services. The funded status of the typical U.S. corporate pension plan in June declined 6.0 percentage points to 74.0 percent. Through the end of June 2010, the funded status of the typical U.S. corporate pension plan is down 9.5 percentage points. For more information, please refer to the BNY Mellon Pension Services website available through [www.bnymellon.com](http://www.bnymellon.com).

2 The Pension Management Research Panel, sponsored by SEI's Institutional Group in January 2010, conducted a “Quick Poll” asking executives to identify their organization's top 10 pension priorities for this year. Participating pension plan sponsors cited their number one priority for 2010 is to find a way to control funded status volatility.

3 Duration is a measure of average key rate sensitivities of future expected cash flows. Duration accounts for approximately 70-75% of the total risk of a typical basket of investment grade bonds in our experience.

## Exhibit 2 – Duration Hedge Mechanics

Using U.S. Treasury futures and interest rate swaps to adjust duration



Data Source: BNY Mellon Beta Management, 2010

In our observation, overlays that used interest rate swaps to gain duration exposure experienced significant, unintended outperformance when the Aa corporate rate used to discount liabilities diverged sharply from the swap rate used to hedge liabilities during the final quarter of 2008.

## Risk #2: Spread Risk

### The Challenge:

Recent market dislocations resulting from the credit crunch highlighted a number of inefficiencies and unanticipated risks associated with using derivatives as part of an LDI strategy. For example, in our observation, overlays that used interest rate swaps to gain duration exposure experienced significant, unintended outperformance when the Aa corporate rate used to discount the liability and the swap rate used to hedge the liability diverged dramatically in the final quarter of 2008.

Previously unthinkable, the swap curve actually traded through the risk-free yield curve during the height of the financial crisis in October 2008, even as credit spreads widened dramatically.<sup>4</sup> Plan sponsors who believed that implementing a duration-based LDI strategy would insulate their portfolio from cash flow mismatches were in for a pleasant, yet still disconcerting, surprise. Instead of reducing mismatches between pension assets and liabilities plans, using these interest rate swap overlay strategies actually increased the tracking error of the surplus.

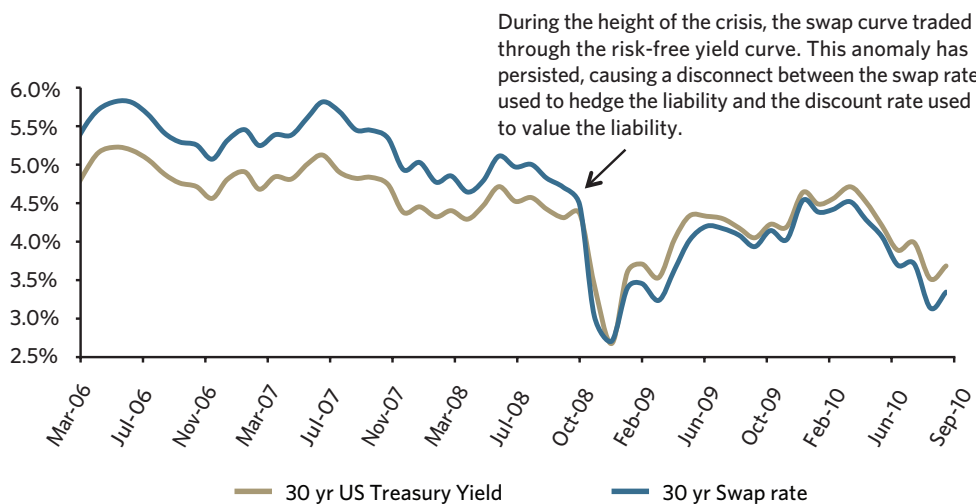
This tracking error created windfall profits on typical interest rate swap positions at the end of 2008 and across 2009, in our experience, it also exposed a critical design flaw. Namely, unless the plan takes measures to manage spread risk, the hedged portfolio is left vulnerable to changes in credit quality in the marketplace.<sup>5</sup>

<sup>4</sup> Even as late as the end of September 2010, the option-adjusted 30 year zero-coupon swap spread over 30 year Treasury STRIPS was roughly -30 basis points vs. an average of + 64 basis points over the prior 15 year period.

<sup>5</sup> In a recent study ("A Practical Approach to Analyzing and Implementing a Liability-Driven Fixed Income Portfolio"; March 2010), ING reminded, "The funded status of the plan will not be fully protected unless the liability's sensitivity to changes in corporate bond spreads is also well managed." In fact, as ING points out, "the Aa discount rate...should be viewed as two distinct pieces instead of one aggregate number: a Treasury yield plus a corporate bond spread." Modeling a "typical" liability profile, ING decomposed the volatility of the liability returns as follows: "71% was specifically due to movements in Treasury yields while 28% was the result of changes in corporate bond spreads — a 2.5-to-1 ratio."; In our observation, these two factors tend to be negatively correlated, and those correlations are non-stationary.

### Exhibit 3 - Aberrations in the Swap Curve

The swap curve traded through the risk-free yield curve during the height of the financial crisis in October 2008, even as credit spreads widened dramatically.



Data Source: Bloomberg, LP

For example, during a period of spread tightening, a plan using traditional interest rate swap overlays could generally expect to experience negative performance and may even be subject to significant drawdowns. The result has been a reconsideration of interest rate swaps as the predominant instrument of choice for LDI and a renewed focus on managers offering more diversified LDI solutions incorporating some combination of bonds with derivatives.

#### A Synthetic Solution:

While duration-only overlays may reduce mismatches to the custom liability, plan sponsors have learned to be sensitive to credit spread risk as well. Achieving spread risk parity may better align the plan assets and liabilities and may offer an appealing option to the traditional approach of using fixed income futures or interest rate swaps alone. Under such an approach, the sponsor would allocate to corporate bonds (or mostly to corporate bonds) and complete the overall asset allocation with an equity overlay.

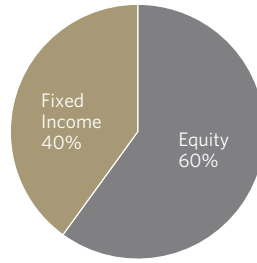
In addition to mitigating spread risk, there may be an appealing yield pickup. Holding physical fixed income in lieu of equities could allow the plan to yield a greater coupon payment as bond coupons tend to be larger than stock dividends. In a market environment with a steep yield curve, exchanging the fixed income/interest rate swap overlay for an equity derivative overlay (via swaps or futures) may potentially create opportunities to increase carry as a long bond portfolio will generally pay a higher yield than the financing rate on the equity overlay. For example, in early 2010, the spread between the paying short term rates and investing long term rates could yield as much as 4%, although this will change over time. Coupling a physical bond portfolio with an equity futures overlay could allow the plan to take advantage of equity price appreciation, while potentially offering greater income yield by the investment in fixed income physical assets.

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## Exhibit 4 – Illustration of Alternative Overlay Approaches

Derivatives can be used to increase portfolio level exposures

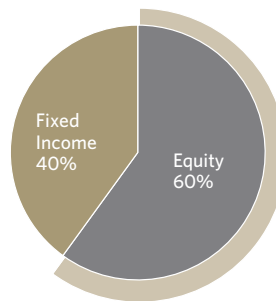
The greater the allocation to fixed income, the more closely assets are aligned with liabilities



The greater the allocation to equity, the more potential for excess return above the plan benchmark

### Fixed Income Derivative Overlay

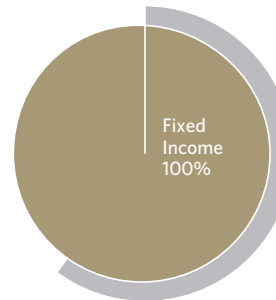
Combining physical investment in equities and fixed income with a duration overlay can lever the portfolio's fixed income exposures to more closely align assets with liabilities



Synthetic Duration Overlay

### Equity Derivative Overlay

Combining physical investment in fixed income with an equity overlay can provide spread risk parity and potentially increase yield capture, while taking advantage of equity price appreciation



60% Synthetic equity overlay, targeted to plan benchmarks, completes the strategic asset allocation

For illustrative purposes only.  
Data Source: BNY Mellon Beta Management, 2010

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## Risk #3: Asset Allocation Drift Risk

### The Challenge:

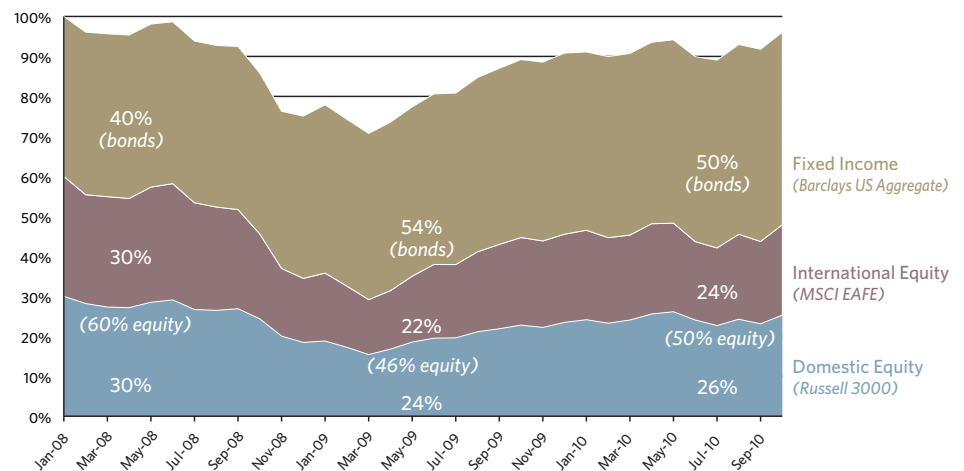
The market turmoil since 2008 has left many institutional investors with actual asset allocations that are significantly out of line with their investment policy targets.

In 2008, the historic sell-off in the equity markets, combined with modest gains in the broad fixed income indices, pushed the portfolio allocations of institutional investors far from their targets. Since then, investors, who missed the dramatic equity recovery that took place from March 2008 into early 2010, have struggled with the question of when, or even if, to rebalance. Volatile conditions year-to-date have further heightened anxiety. Investors may continue to be exposed to tracking error versus their benchmarks that they may wish to eliminate.

A carefully structured overlay program can potentially help improve cash flow, restore portfolio exposures to policy weights, and minimize tracking error, while avoiding the expense and opportunity costs of forced equity and bond sales.

### Exhibit 5 - Illustration of the Risk of Not Rebalancing

As shown below, without rebalancing, the decline in equity markets during 2008 resulted in allocations far from target, which did not self-correct with the subsequent 2009 rally in equities.



Using the respective indices' total returns with a 12/31/07 starting allocation of 30% domestic equity, 30% international equity, and 40% fixed income, the illustration shows the change in total value and respective allocations over time. The indices noted in this illustration are unmanaged, are not available for direct investment, and are not subject to management fees, transaction costs, or other types of expenses that a fund or portfolio may incur. Past performance is no guarantee of future returns.

Data Source: Russell Investments, MSCI, Barclays Capital, BNY Mellon Beta Management, September 2010.

### A Synthetic Solution:

A carefully structured overlay program (where the risks of cash margin calls are recognized and managed) can potentially help improve cash flow, restore portfolio exposures to policy weights, and minimize tracking error, while avoiding the expense and opportunity costs of forced equity and bond sales.<sup>6</sup> A Beta Manager can also make use of existing cash positions with futures to create a liquid overlay generating a target asset mix until there is a need for liquidity. The process of cash overlay can approximate virtually any asset class as long as it is capable of being represented by a sufficiently liquid and efficient derivatives market. Furthermore, costs incurred when rebalancing with derivatives tend to be lower than rebalance trades involving physicals.<sup>7</sup>

<sup>6</sup> For more on this aspect of exposure management, see "Policy Implementation in an Illiquid World" available at our website: [www.mellon.com/transitionmanagementservices](http://www.mellon.com/transitionmanagementservices).

<sup>7</sup> See "The Quest for Beta: Balancing Risks with Costs and Returns" available at our website.

## Risk #4: Inflation Risk

### The Challenge:

Given the unprecedented monetary accommodation by most major central banks to foster an economic recovery in conjunction with the loose fiscal policies of the largest developed nations, many investors are concerned about future inflation. Beyond the inflation-linked bonds offered in some developed markets, few investments that are considered candidates for institutional portfolios seem to offer proven, stable track records that would hedge inflation. Commodities, alternative assets (like timber, farmland or infrastructure), real estate, or equities, among other asset classes, all may offer varying degrees of inflation protection, but none seem to provide consistent insurance against a spike in inflation.

### A Synthetic Solution:

Plan sponsors can utilize a variety of strategies, including shorting U.S. Treasury futures, purchasing puts on U.S. Treasury futures, purchasing payer swaptions, and purchasing interest rate caps — all designed to tailor a plan's interest rate exposure profile to a custom benchmark.

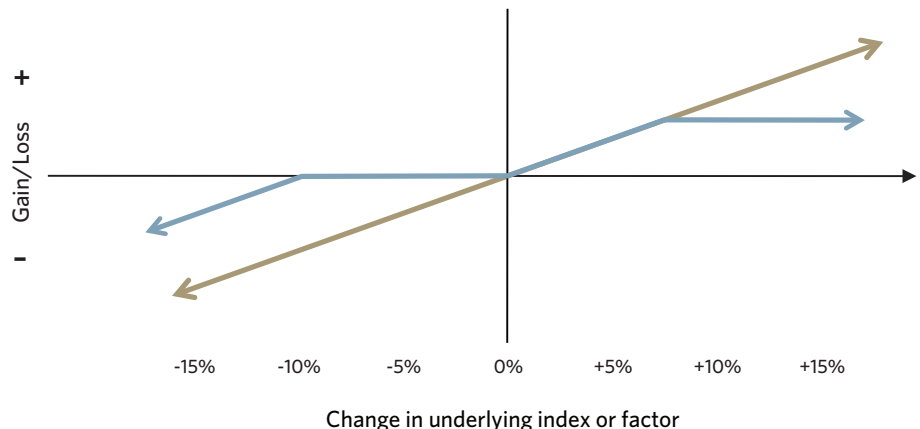
- **Shorting U.S. Treasury Futures** Shorting U.S. Treasury futures provides a symmetric return for changes in interest rates. As U.S. Treasury rates rise, the hedge will gain and as rates fall, the hedge will lose. This type of hedge may be useful for clients who have physical interest rate risk through a bond portfolio. A bond portfolio will tend to lose value if rates rise. Shorting U.S. Treasury futures may provide a useful hedge for sponsors who wish to immunize their portfolio from interest rate risk.
- **Puts on U.S. Treasury Futures** Alternatively, sponsors may prefer an asymmetric return profile. Sponsors can use puts on U.S. Treasury futures or payer swaptions to benefit from rising interest rates without having to suffer losses on their hedge if rates fall. The trade-off of an asymmetric return is an upfront cost ('premium') that may not be recouped.

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### Exhibit 6 - Symmetric vs. Asymmetric Hedge Profiles

**Symmetric Derivatives** such as futures move in line with the desired or underlying exposure

**Asymmetric Derivatives** such as options are truncated in one direction



Data Source: BNY Mellon Asset Management

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## Risk #5: Tail Risk

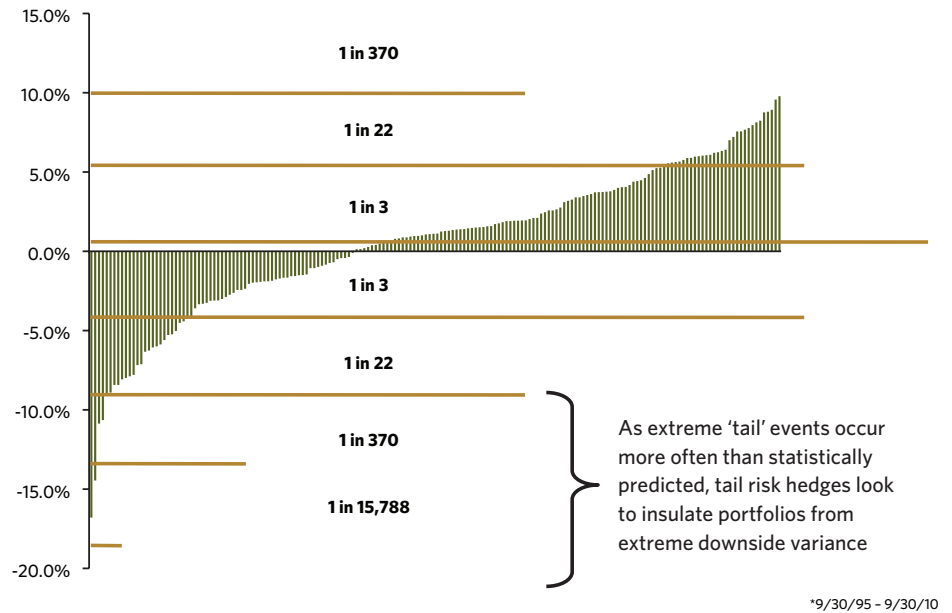
### The Challenge:

Heightened equity volatility (not to mention the scars of two bear markets in the last decade) are prompting many institutional investors to consider “de-risking” their portfolios by cutting off the “fat left tail” associated with a typical return profile for a portfolio holding equities.

“Tail risk” hedges look to insulate portfolios from extreme downside variance.

### Exhibit 7 - Fat Tails

This graph shows the range of monthly returns for the S&P 500 Index over the past 15 years\* against the statistical probability of those specific monthly returns occurring. While the “bell curve” is a valid theoretical distribution, realized returns tend to exhibit longer negative tails than the bell curve would suggest.



Data Source: Standard & Poor's, BNY Mellon Beta Management. Past performance is no guarantee of future results.

So-called “tail risk” hedges look to insulate portfolios from extreme downside variance. Not surprisingly, however, the cost of buying flood insurance when a potential hurricane is on the horizon often proves prohibitively expensive. As the third quarter of 2010 drew to a close, for example, buying a six month at-the-money put on the S&P 500 index was indicated to cost more than 7% of portfolio value.<sup>8</sup>

### A Synthetic Solution:

Derivatives offer a great amount of flexibility to customize strategies that suit a given objective and constraint profile. Both listed and over-the-counter options, for example, give investors the choice of paying for “portfolio insurance” or alternatively creating a structure that trades potential upside for a guaranteed minimum value. Investors can easily express views and accommodate risk tolerance by specifying strike prices to best suit their investment goals and constraints.

<sup>8</sup> Compared to less than 6% in April of 2010. Source BNY Mellon Beta Management, 2010.

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Passive hedging programs can be extremely simple in design or may take a more dynamic approach adjusting for periodic cash flows and interim volatility.

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Some examples of derivative strategies include:

- **Collars** – Sponsors who do not wish to pay an upfront premium can instead fund their downside protection by selling the potential upside of their portfolio. A collar essentially locks in a portfolio’s value between lower and upper strikes, minimizing the market value volatility. These combinations can be structured to be initiated at zero initial cost to the investor.
- **Spreads** – Additional options-based strategies that sponsors may find useful include bear spreads, and put spread collars. These strategies, which trade off on structural market imbalances like the well-documented “volatility smile,” can be potentially appealing in markets with high volatility and put-call skew.<sup>9</sup>
- **Variance Swaps** – These instruments provide sponsors with a tool to directly index asset variance. Sponsors may find that variance swaps are most useful as a downside equity hedge given the historical negative correlation between equity index returns and equity variance.
- **Cross-asset Hedges** – Investors concerned about purchasing insurance as efficiently as possible and inclined to assume some basis risk may also consider employing a beta manager to help identify situations when, for example, purchasing out-of-the-money puts on an emerging markets index could be used to insulate a decline in a domestic equity portfolio more cheaply than domestic index contracts.

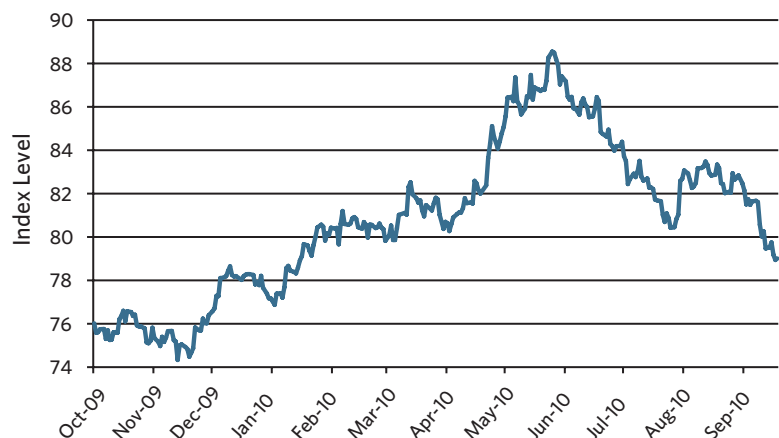
## Risk #6: Currency Risk

### The Challenge:

For investors looking to add diversification by increasing allocations to global assets, the volatility of the major currency pairs has been cause for significant concern. Currency has often been viewed as an incidental exposure incurred when investing beyond one’s home border. For those with such a view, currency represents an uncompensated risk over the long horizon, and as such represents a natural candidate for a hedging program.

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**Exhibit 8 - Currency Volatility - The U.S. Dollar Index (USD)**



The US Dollar Index (USD) is an index (or measure) of the value of the United States dollar relative to a basket of foreign currencies. USD goes up when the US dollar gains “strength” (value) when compared to other currencies.

Data Source: BNY Mellon Beta Management, 2010

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<sup>9</sup> The “volatility smile” or “smirk” is a phenomenon long documented in the academic literature on derivatives. Contrary to the conditions outlined in options pricing models like Black-Scholes, the market implied volatility (IV) for a given underlying does not tend to be constant across a range of strikes. Out-of-the-money (OTM) puts tend to exhibit higher IVs than OTM calls. For more on how this could work to an investor’s advantage, refer to the summer 2010 quarterly *In Transition* available at our website.

### **A Synthetic Solution:**

Passive hedging programs can be extremely simple in design like a one-time “model and monitor” overlay designed to translate an initial overseas investment into the terms of the home currency. Alternatively, a beta manager may take a more dynamic approach adjusting for periodic cash flows and interim volatility.

## Dynamic Beta Management

There is no one-size-fits-all approach to managing portfolio risk. A specialist beta manager offering a comprehensive and integrated approach to derivatives can be a useful partner for investors using or seeking to implement a targeted risk-hedging approach to managing their portfolios. The core competencies of an Exposure Manager include:

- The capacity to maintain oversight of the aggregate exposures across the derivative and physical based mandates
- The ability to maintain fully customized hedges in support of plan policy
- Strong research on transaction costs to identify implementation trade-offs and commensurate risks
- The infrastructure to monitor and control for counterparty risk.

The potential benefits to the institutional investor:

- Increase the efficient use of capital in the plan, complementing a carefully selected array of alpha managers with a single, customized, beta solution
- Execute on the policy goal of remaining fully invested at benchmark weights at all times through integrated rebalancing
- Introduce efficient synthetic solutions in the midst of market dislocations to mitigate volatile elements of portfolio risk
- Provide a single point of contact to alleviate the operational complexities that may be associated with derivatives

While the sponsor’s goal is consistent — to fund its obligations — the implementation of this objective could take many forms in order to adapt to the constantly changing economic climate. Within such a framework, the Beta Manager provides a toolkit of solutions, including interest rate swaps, inflation swaps, bond futures, and equity index futures, among other instruments, in order to reduce a broad range of investment risks.

**Jamie Cashman, Global Head of Marketing**

Jamie Cashman is global head of marketing for BNY Mellon Beta Management, responsible for marketing beta management services. Jamie has 16 years of industry experience and has previously worked for the Institutional Equity Division of Morgan Stanley and was a derivatives operations specialist at Credit Suisse. He is a graduate of Georgetown University and has earned the designations of CFA charterholder, Certified Investment Management Analyst (CIMA), Financial Risk Manager (FRM) and Professional Risk Manager (PRM). He is a co-author of "The Quest for Beta: Balancing Risks with Costs and Returns" which appeared in the Summer 2010 issue of the *Journal of Investing*.

**Keith Eiger, Product Strategist**

Keith Eiger is a product strategist at BNY Mellon Beta Management and Mellon Transition Management, responsible for business development, new business proposals, and marketing collateral management. Previously, he spent 12 years in Barclays Global Investors' institutional business, holding roles in client sales and service, communications and marketing. Keith received a B.S in Psychology from Saint Lawrence University and a certificate in Business Administration from the University of California, Berkeley. He is a co-author of "The Quest for Beta: Balancing Risks with Costs and Returns" which appeared in the Summer 2010 issue of the *Journal of Investing*.

**Jay Kwon, Portfolio Manager**

Jay Kwon is a portfolio manager responsible for the risk management, modeling, and trading of BNY Mellon Beta Management overlays. Prior to joining BNY Mellon Beta Management, he was a fixed income portfolio manager at Mellon Transition Management and a risk manager for interest rate swap portfolios for the Federal Home Loan Bank of San Francisco. Jay is an Economics graduate of Stanford University and California State University at Hayward and received his MBA at the University of Oxford. He is CFA charterholder and a member of the CFA Society of San Francisco.

## Appendix of Indices

These benchmarks used are broad-based indices which are used for comparative purposes only and have been selected as they are well known and are easily recognizable by investors. Comparisons to benchmarks have limitations because benchmarks have volatility and other material characteristics that may differ from the fund or portfolio to which they are compared. For example, investments made for the fund or portfolio may differ significantly in terms of security holdings, industry weightings, and asset allocation from those of the benchmark. According, investment results and volatility of the fund or portfolio may differ from those of the benchmark. Also, the indices noted in this presentation, are unmanaged, are not available for direct investment, and are not subject to management fees, transaction costs, or other types of expenses that the fund or portfolio may incur. In addition, the performance of the indices reflects reinvestment of dividends, and, where applicable, capital gains distributions. Therefore investors should carefully consider these limitations and differences when evaluating the comparative benchmark data performance.

The indices are trademarks and have been licensed for use by The Bank of New York Mellon Corporation (together with its affiliates and subsidiaries) and are used solely herein for comparative purposes. The foregoing licensors are not affiliated with The Bank of New York Mellon Corporation, do not endorse, sponsor, sell or promote the investment strategies or products mentioned in this paper and they make no representation regarding advisability of investing in the products and strategies described herein.

The Barclays Capital U.S. Aggregate Bond Index is a broad-based benchmark that measures the investment grade, U.S. dollar-denominated, fixed-rate taxable bond market, including Treasuries, government-related and corporate securities, MBS (agency fixed-rate and hybrid ARM pass-throughs), ABS and CMBS.

The MSCI EAFE Index (Europe, Australasia, Far East) is a free float-adjusted market capitalization index that is designed to measure the equity market performance of developed markets, excluding the US & Canada. As of May 27, 2010 the MSCI EAFE Index consisted of the following 22 developed market country indices: Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and the United Kingdom.

The Russell 3000 Index measures the performance of the largest 3000 U.S. companies representing approximately 98% of the investable U.S. equity market. The Russell 3000 Index is constructed to provide a comprehensive, unbiased, and stable barometer of the broad market and is completely reconstituted annually to ensure new and growing equities are reflected.

The S&P 500® has been widely regarded as the best single gauge of the large cap U.S. equities market since the index was first published in 1957. The index has over US\$ 3.5 trillion benchmarked, with index assets comprising approximately US\$ 915 billion of this total. The index includes 500 leading companies in leading industries of the U.S. economy, capturing 75% coverage of U.S. equities.

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## BNY Mellon Pension Liability Index

The BNY Mellon Pension Liability Indexes are calculated using the present values of hypothetical Retired, Mature, Typical, and Young benefit liability cash flow schedules, as calculated by BNY Mellon research. These cash flows are discounted according to a proprietary term structure model applied to every forward payment date. Pricing for the term structure model is developed from BNY Mellon internal research. Returns for each of the BNY Mellon Pension Liability Indexes are calculated from monthly changes in the present values of each index. Index valuations and return calculations are performed using two sets of data. The Reporting Basis discounting uses high-grade corporate bond yields to fit a proprietary BNY Mellon term structure model. This method is intended to provide a reasonable approximation of the methodologies generally used for accounting and funding purposes. The Market Value Basis discounting uses US Treasury bond yields to fit a proprietary BNY Mellon term structure model. This method is intended to provide a reasonable approximation of the cost to purchase annuities for the liabilities.

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## US Dollar Index

The US Dollar Index is a geometrically-averaged calculation of six currencies weighted against the US dollar. The US Dollar Index was created by the US Federal Reserve in 1973, and is now listed on the ICE Futures Exchange. The ICE US Dollar Index is calculated by Reuters in real time approximately every 15 seconds from a multi-contributor feed of the spot prices of the Index's component currencies. The price used for the calculation of the Index is the mid-point between the Reuters top of the book bid/offer in the component currencies. This real-time calculation is delivered to the Exchange and redistributed to all data vendors.



For illustration purposes only; this is not intended as investment advice. The strategies referenced in the preceding article are not a comprehensive list of solutions. There may be additional solutions based on client risk tolerances, goals and the market climate. Past results are not necessarily indicative of future performance. You should not assume that the risk referenced above represents all risk involved with the management of assets or overlays or the execution of a transition event as the risks for each assignment vary according to client goals, strategy and market climate. There is no guarantee that losses or costs will not occur. The statements and opinions expressed herein are those of the authors and can change at any time without notice. The information included herein has been developed internally, and/or obtained from sources BNY Mellon Beta Management believes to be reliable; however, BNY Mellon Beta Management does not guarantee the accuracy or completeness of such information. Nothing contained in this material is intended to constitute legal, tax, securities, or investment advice, nor an opinion regarding the appropriateness of any investment, nor a solicitation of any type. Any results or information presented based on simulated or hypothetical performance results have certain inherent limitations. Unlike actual results, any simulated or hypothetical results do not represent actual trading. Also, because trades have not actually been executed, simulated results may have under-or-overcompensated for the impact, if any, of certain market factors such as lack of liquidity. Simulated or hypothetical programs in general are also subject to the fact that they are designed with the benefit of hindsight. The investment products and services mentioned here are not insured by the FDIC (or any other state or federal agency), are not guaranteed by any bank and may lose value. This material does not constitute an offer or solicitation to any person in any jurisdiction in which such offer or solicitation is not authorized or to any person to whom it would be unlawful to make such offer or solicitation. BNY Mellon Beta Management operates as a branded entity contracting under The Bank of New York Mellon, a subsidiary of The Bank of New York Mellon Corporation.