

# The Defined Benefit Risk/Solution Spectrum

By

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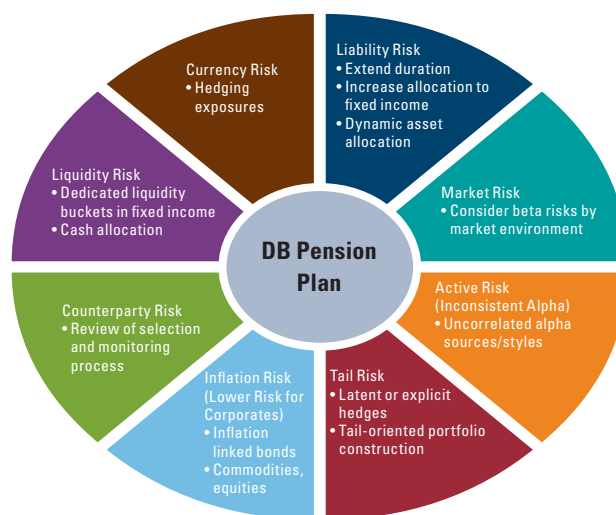
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## OVERVIEW

More than ever, defined benefit (DB) plan sponsors are acutely aware that they are surrounded by different forms of risk. **Figure 1** illustrates this spectrum and sketches the solutions we advocate for managing its various forms. As a general guide to the different categories of risk, this document pertains to both US and non-US plans, although the discussion of certain risks is specifically grounded in a US-based regulatory context. In each case, we describe the challenges the risk presents, noting, as appropriate, unique concerns for corporate versus public plans, and suggest ways to mitigate the risk in question, either through portfolio construction and asset allocation strategies, or preventative policy measures.

**Figure 1**

### The Wheel of Pension Risk



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## Liability Risk

### Corporate Plan Liability Risk

Liability-driven investing (LDI) has received much attention in recent years as a way to hedge liability risk. Rather than a fixed income immunization strategy, we think of LDI as a spectrum of potential investment solutions within a risk measurement framework that captures volatility in both assets and liabilities, and assesses the interaction of the two. Funded-ratio volatility, i.e., the volatility of assets relative to the liability, is the key risk metric.

Common first steps for plans that want to reduce funded-ratio volatility are to replace core bond exposure with long bonds and to extend duration using synthetic instruments. For plans with a high equity allocation, both of these steps reduce funded-ratio volatility only modestly because equity risk is still dominant. More dramatic changes to asset allocation — namely, a reduction in equity market exposure — would be necessary to achieve a more meaningful reduction in volatility. This is a difficult step for some plan sponsors to take, as it means sacrificing expected return, if you believe, as we do, that equities will outperform bonds over the long term.

#### *An Emphasis on Active Risk*

To mitigate the tradeoff between return-seeking and liability-matching objectives, plan sponsors might consider replacing core exposure with strategies that have higher levels of active risk to generate returns. For example, redeploying a portion of equities into long bonds will reduce volatility; simultaneously replacing core equity exposures with active strategies that have higher alpha potential can offset the loss in expected return associated with the lower equity allocation. Examples of such

strategies include non-benchmark-oriented unconstrained and opportunistic equity exposures as a substitute for core equity, or combining market-neutral independent alpha sources with synthetic long-bond exposure in place of a physical long-bond allocation. (See the “Active Risk” section beginning on page 6 for additional considerations related to increasing exposure to active-risk sources.)

#### *Dynamic Asset Allocation for Corporate Plans*

Plan sponsors should also consider that they face an asymmetric risk and reward tradeoff as the funded ratio approaches 100%. Creating or adding to a surplus position is of limited benefit, whereas unexpected deficits lead to higher contributions. In other words, the plan is rewarded for risk only to the point at which the assets are sufficient to meet the liability, yet it is fully exposed to the risk of a decline in the funded ratio. Therefore, increasing the emphasis on liability-matching strategies as the funded ratio improves should be an objective of a dynamic asset allocation strategy.

As a first step, plan sponsors must determine what their ultimate funding objective is. Frozen plans, where participants no longer accrue benefits, have little to no use for surplus assets, so one would expect these plans to redeploy almost all return-generating assets into liability-matching strategies as funded ratios approach 100%. For plan sponsors considering a risk transfer to a third-party insurer, the funding objective might be higher, typically in a range of 105% to 120% funded depending on the plan’s demographics and benefit provisions.

In contrast, sponsors of active plans, where some or all participants continue to earn accruals, can use a surplus to offset the cost of future benefit accruals, but must weigh this

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As a strategist in the Asset Allocation Strategies Group and the group’s LDI practice leader, Amy analyzes the effect of asset allocation strategy on funding and accounting policies for retirement plans. She also develops asset/liability management models to help clients evaluate and manage the level of risk in their retirement programs.



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As the director of Strategic Asset Allocation, Wendy structures and manages market neutral and real return portfolios as well as customized solutions for clients seeking specific risk/return objectives. Wendy also researches long-term asset allocation themes, including capital market expectations and issues of overall portfolio structure, in order to assist clients with long-term strategy and policy issues.

potential benefit against how much risk the plan can absorb. A plan sponsor that is willing to contribute the full service cost each year in exchange for minimizing possible contribution surprises has little use for a surplus, and therefore should transition toward a predominantly liability-matching strategy as the funded ratio improves. On the other hand, a plan sponsor that wants to use surplus returns to reduce future costs might perhaps reduce but not eliminate its return-seeking exposure at stronger funded levels.

Plan sponsors can also face an asymmetric risk and reward tradeoff at funded-ratio thresholds — generally between 60% and 80% — where the Pension Protection Act (PPA) imposes additional costs. For example, plans that are less than 80% funded are restricted from using credit balances to offset contributions, and also might have to pay additional “at-risk” contributions. In addition, many plan sponsors have a funding policy of contributing the amount necessary to maintain an 80% funded ratio. If any of these factors apply, it means that the cost of a decline in funded status that pushes the funded ratio below 80% is of greater magnitude than the savings materializing from an equal improvement in the funded ratio. Plans that are affected by the various PPA penalties and restrictions, therefore, are likely to become more risk averse once funding crosses these thresholds; however, this still must be balanced against the need for return-generating assets as many plans would be unwilling to “lock in” a funded ratio of 80%.

Plan sponsors might find it helpful to use the concept of a utility curve as a framework in evaluating how their risk preferences change with changes in the funded ratio. At lower funded ratios, improvements to the funded position are likely to generate large increases in utility. As the funded ratio continues to improve, however, increases in utility will become more marginal, reflective of the PPA benefit restrictions and of the limited use for surplus assets (Figure 2).

**Public Plan Liability Risk**

With average funded ratios currently estimated at about 65%,<sup>1</sup> public defined benefit plans find themselves in a challenging position, trying to strike a balance between competing objectives. On the one hand, they want to reduce volatility in order to limit potential further erosion in their funded ratio. On the other hand, they often have limited ability to improve their funded ratio by reducing benefits or increasing contributions,

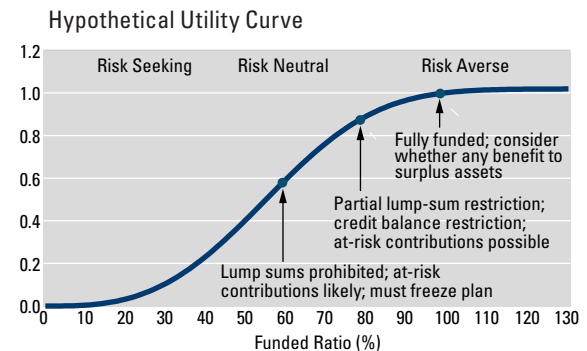
and so are left with no choice but to continue with a return-seeking orientation in their portfolios, looking to investment returns to restore funded status.

The accounting and funding rules governing public plans add to this dilemma by operating in a framework that can make it costly to de-risk. The discount rate used to value the liability is based on the long-term expected return on the asset portfolio and typically is static.<sup>2</sup> A common discount rate assumption is 8%, meaning that the liability grows 8% annually with no volatility; clearly, there is no asset that can achieve this same return and risk target. Asset volatility, therefore, drives volatility in the funded ratio and in contributions, and cash is the volatility-minimizing asset (Figure 3).

Another perspective, however, holds that a portfolio of long bonds with the same duration as the liability minimizes volatility. Intuitively, this makes sense, as the portfolio could be constructed so its cash flows match the anticipated benefit payments from the plan. Even if interest rates rose, driving down the market value of the asset portfolio, the plan should be considered fully funded because the asset’s cash flows would still support the plan’s benefit payments. From this perspective, risk is viewed in an asset-liability framework and the key risk metric, funded-ratio volatility, captures volatility in both the assets and liabilities.

Figure 2

**Funded Ratio Utility Reflects Asymmetric Risk/Reward Tradeoffs**



Source: Wellington Management

<sup>1</sup>Wilshire Associates, 2010

<sup>2</sup>The Governmental Accounting Standards Board (GASB) is currently considering whether to use a market-based discount rate to value the liability. Because GASB has not yet issued an Exposure Draft, this paper does not contemplate potential GASB changes.

Figure 3

**Comparison of Asset-Only and Asset-Liability Frameworks**

	Asset-Only Framework	Asset-Liability Framework
Return Metric	Asset Return	Surplus Return
Risk Metric	Asset Volatility	Funded Ratio Volatility
Regulatory/Academic Basis	Public Funding/GASB rules	PPA; FASB; Financial Economics
Liability Discount Rate	Expected long term return on assets	Yield on portfolio of cashflow matched bonds
Volatility-Minimizing Asset	Cash	Long Bonds
Considerations	<ul style="list-style-type: none"> <li>Expected return on cash cannot support current discount rates</li> <li>Liability has asset mix related discount rate and 0% volatility: no matching asset</li> </ul>	<ul style="list-style-type: none"> <li>Risk reducing properties of long bonds are not reflected in Funding/GASB rules</li> <li>Long bonds ultimately lead to higher expected but more certain cost than riskier return-seeking strategy</li> </ul>

Source: Wellington Management

Under public plan funding and accounting rules, however, implementing a long-bond cash flow-matching strategy is painful as it necessitates a lower discount rate. For example, we estimate that a long-bond portfolio would support a discount rate of 6% versus the 8% assumption used by most plans, causing the typical funded ratio to fall by about 30%. Certainly we are not suggesting that public plans contemplate implementing a 100% long-bond strategy, but even with de-risking on smaller scale, such as a 5% to 10% shift out of equities into bonds, the increase in contributions due to the markdown in the funded ratio at the lower discount rate typically exceeds the potential benefit from lower volatility,

at least over the short term. Many sponsors do not have the appetite to take on higher contributions in the current environment, so maintaining the current discount rate takes precedence over reducing risk.

Still, some plan sponsors, wary of the experience of 2008, might want to reduce risk at a more opportune time. Accordingly, such plan sponsors might consider the benefits of a customized dynamic asset allocation that de-risks incrementally as plan characteristics, particularly the funded ratio, and market conditions evolve. An attractive initial step would be to incrementally reduce volatility but maintain the current expected return on assets. In our view, an effective way to do this is to increase the plan’s reliance on active risk to generate returns. As we discussed in connection with corporate plans, public plans can also reduce volatility (in both an asset-only and asset-liability framework) by redeploying a portion of equities into long bonds; simultaneously replacing core equity exposures with more efficient active strategies that have higher alpha potential can offset the loss in expected return associated with the lower equity allocation.

Examples of such strategies include non-benchmark-oriented unconstrained and opportunistic equity exposures as a substitute for core equity, or combining market-neutral independent alpha sources with synthetic long-bond exposure in place of a physical long-bond allocation. If the portfolio is constrained to maintain the current expected return objective, the reduction in volatility could be fairly modest, but this should still be considered a good first step in a broader plan to reduce risk. More dramatic changes to asset allocation — namely, a significant reduction in equity market exposure — would be necessary to achieve a more meaningful reduction in volatility. But, again, this might not be palatable until funded ratios improve or interest rates rise, which argues for a dynamic approach to asset allocation.

**Market Risk**

As pension plan sponsors assess the beta diversification of their portfolios, they commonly emphasize the importance of allocations to specific asset classes, managers, or strategies. But with this type of focus, plan sponsors may neglect to consider the contribution-to-risk profile of their investments, and thereby risk operating with an inaccurate sense of their portfolio’s diversification. A method of gauging a portfolio’s exposure to beta, or market risk, the contribution-to-risk metric takes into account the size of allocations, volatility of exposures, and the correlations among exposures in the portfolio.

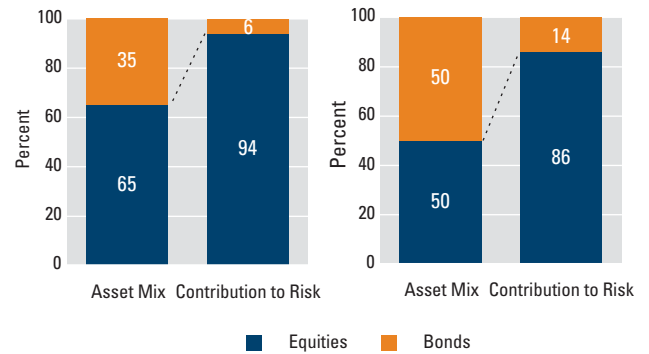
Beta exposures are typically not well diversified. Most traditional balanced portfolios, for example, are dominated by equity risk because of the higher volatility of equities relative to fixed income. For example, in a traditional balanced portfolio (65% global equities/35% global bonds), equities contribute almost 95% of the asset risk. Even when the allocation is shifted to 50% global equities and 50% global bonds, equities contribute over 85% of the overall portfolio risk (Figure 4).

Assets that are expected to outperform in periods of strong economic growth, such as equities and corporate spreads, tend to dominate most pension portfolios. Importantly, growth assets such as equities also tend to be negatively skewed, and thus can contribute to severe negative outcomes. To remedy this situation, we recommend plan sponsors seek more balanced exposure to various types of market risk. A more balanced portfolio allocates to risks more equally, which may mean taking greater exposure to weak-growth assets in fixed income (e.g., long-duration nominal bonds) as well as greater exposure to assets that have historically performed well in inflationary environments, such as commodities, precious metals, and inflation-linked bonds (Figure 5). This structure can help ensure that portfolios behave more consistently in a variety of market environments, from conditions of strong growth to weak growth, and in the presence of inflationary or disinflationary trends.

Plan sponsors might find it helpful to identify the type of market environment in which each asset class in the portfolio is expected to perform best, and then determine the contribution to risk from each market environment. For example, Figure 6 compares the risk profile of a 65/35 equity/bond asset mix, which has almost 90% of its risk exposure to assets that perform well in strong growth environments, with a “Balanced Risk Portfolio.” To achieve this degree of balance in the latter portfolio while maintaining expected returns, the plan sponsor will likely need to rely on leverage of the beta exposures and/or market-neutral independent alpha sources transported over the beta exposures. For plans that are unable or unwilling to employ these types of strategies, better beta diversification is still achievable by increasing allocations to real assets (inflation environment) and by extending duration (weak growth environment).

Figure 4

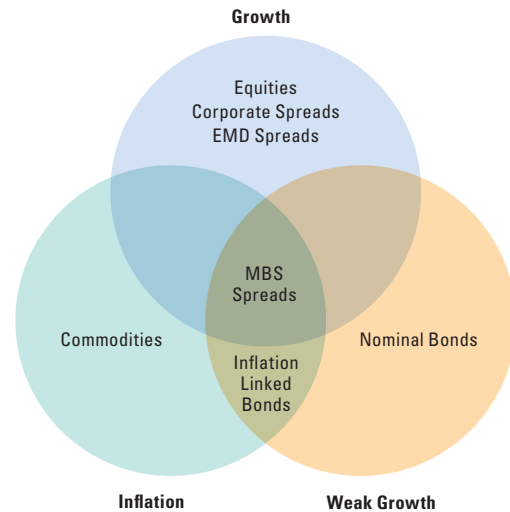
Typical Balanced Portfolios Are Dominated by Equity Risk



Source: Wellington Management

Figure 5

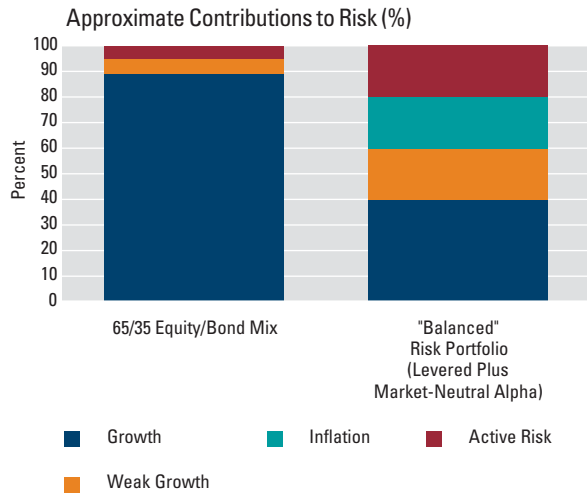
Balance Risk Exposures to Economic Environments



Source: Wellington Management

**Figure 6**

**Risk Exposures by Economic Environments**



Source: Wellington Management

As shown in **Figure 6**, plans often have only modest exposure to active-risk sources; the next section describes why a plan sponsor might want to increase this exposure and strategies for implementation.

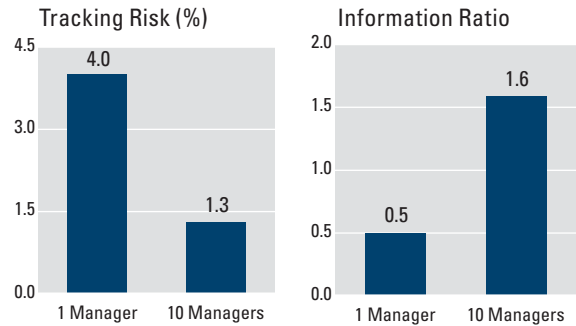
**Active Risk**

With beta, or market risk, returns are sought by putting capital at risk in the market, and historically, beta returns are produced most consistently over longer periods in a measure commensurate with the level of risk taken. By contrast, active risk, or alpha, is linked to the skill of an investment manager and is relatively independent of market returns. Importantly, and unlike beta, there is no natural return associated with taking active risk. In order to reap its benefits, rather than its downside, plan sponsors must be deliberate and thorough in their choice of managers.

Active risk can be well worth the requisite due diligence, however, as it offers two important advantages over market risk. First, its payoff can be achieved over a relatively short horizon. Whereas capturing the return of market risk typically requires an ability to stay the course with a particular market exposure through periods of negative returns, active risk exposures are designed to be independent of market shifts, and, thus, are designed to produce alpha in a variety of

**Figure 7**

**Strategy Diversification Benefits**



Source: Wellington Management  
Data is for illustrative purposes only and does not represent an actual investment. No actual manager data was used. Information ratio is defined as the ratio of active return per unit of tracking risk.

market environments. Second, active risk carries a potentially more attractive return-to-risk profile and is more diversifiable than market risk. Using Wellington Management as an example, our equity strategies have alpha correlations that average 0.2, and our fixed income strategies have alpha correlations that average 0.1. These are very low numbers in the context of a -1.0 to +1.0 correlation scale and a 0.4 correlation between broad stock and bond markets. As shown in **Figure 6**, however, plans often have only a modest exposure to active-risk sources.

**Diversified Active Risk**

As alpha generation depends on manager skill, finding consistent alpha can be challenging. It is possible, however, to enhance the consistency of overall alpha capture through a diversified active-risk strategy. Rather than rely on a single alpha stream, investors may find more consistent results by combining multiple, uncorrelated alpha sources across different asset classes and investment styles within a given asset class. The diversification of active risk leads to more consistent risk-adjusted returns in a wide variety of market environments. For example, as shown in **Figure 7**, assuming a consistent 4% tracking risk and 2% alpha for each of ten managers, and uncorrelated strategies, an allocation to the ten managers represents approximately a third of the tracking risk with an information ratio three times as large as that of an allocation to a single manager.

The chance of success of a diversified active-risk strategy can be enhanced by incorporating an active-risk allocation budget in a portfolio’s design. Risk budgeting helps ensure that the contribution to active risk is distributed across alpha sources and that no single alpha source dominates a portfolio’s risk profile. In terms of specific approaches that warrant close attention, we recommend investors consider certain investment types that emphasize active risk. These may include:

- ▶ Unconstrained investments — non-benchmark-oriented strategies that emphasize maximum flexibility so that managers can access alpha opportunities wherever they find them
- ▶ Market-neutral portable alpha strategies — in which active risk is taken where it is determined it will most likely to pay off; alpha generated from the chosen strategy is then transported, using derivatives, to the desired beta allocations

Our recommendation to consider unconstrained strategies is based on the premise that given two managers of equal skill, the one afforded a wider opportunity set and more flexibility will generate higher reward per unit of risk. In fact, our analysis of managers with global equity benchmarks indicates that the higher the tracking risk of the given strategy, the higher the potential alpha and information ratios (IRs; **Figure 8**). This suggests that higher-tracking-risk strategies are worth especially close attention on the part of investors considering their allocations to active risk.

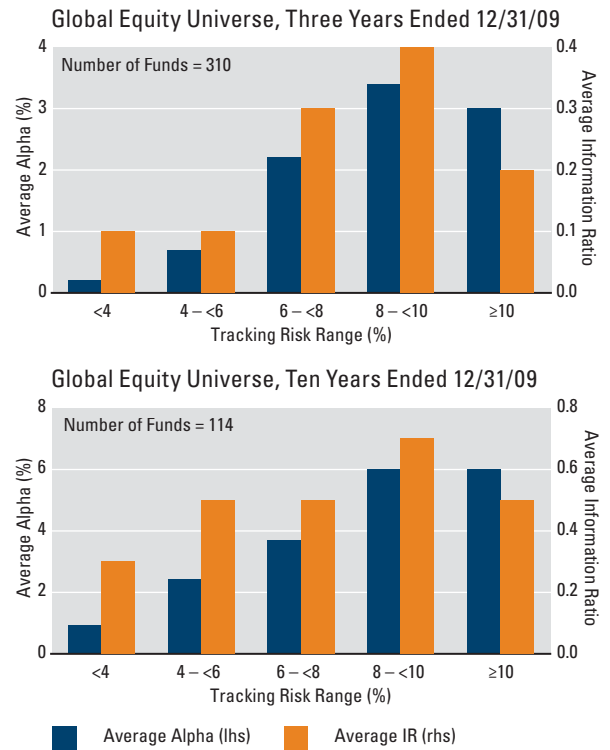
Regarding portable alpha strategies, we would emphasize the importance of the alpha source being market neutral in nature, rather than beta oriented. During the 2008 market crisis, many investors utilizing portable alpha strategies came to realize that the alpha portion of their strategies was primarily beta-oriented, and they, therefore, had “double beta” during the market downturn.

**Tail Risk**

Tail risk can be regarded as the exposure to extremely negative portfolio outcomes — outcomes that often coincide with liquidity evaporation, excessive leverage, and panic. As such, tail risk spans the realms of downside risk, value-at-risk, skewness and kurtosis, the Black Swan theory, and scenario analysis. While its measurement often involves the use of complicated statistics, tail risk is the characterization of “what could go wrong and how bad could it get?”

**Figure 8**

**Higher Tracking Risk Can Lead to Higher Alpha and Information Ratios**

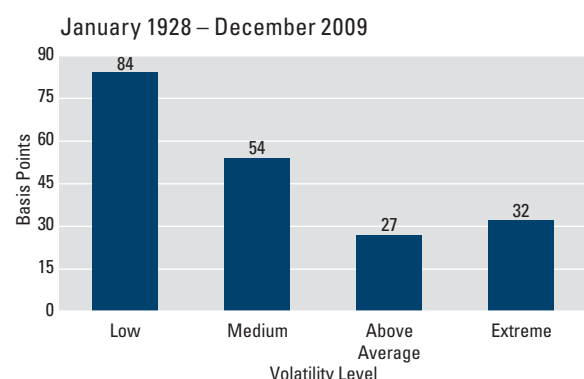


Source: Mercer Performance Analytics using MSCI World as benchmark

**Tail-Risk Mentalities**

In the Asset Allocation Strategies Group, we employ a variety of portfolio construction techniques and explicit hedges in the management of tail risk. This broad tool kit of options enables us to strike an appropriate balance among three common mentalities bearing on tail risk, and offers flexibility to plan sponsors along a spectrum of potential tail-risk solutions.

- ▶ Just Allow Time – This buy-and-hold mentality involves leaning on long-term forecasts, trusting that the portfolio will weather crises and be fine in the long run (that mean reversion will prevail). In connection with this mentality, we advocate a broadening of the strategic portfolio construction process to incorporate tools such as a downside risk framework, risk balancing structure, and absolute-return portfolios.

**Figure 9****S&P 500 Average Risk-Adjusted Excess Returns by Volatility Level**

Source: Wellington Management calculations based on proxy VIX series

- ▶ **Just In Time** – This mentality involves adjusting the portfolio as the market environment changes. Accordingly, tail-risk management here will seek to take advantage of opportunities to manage risk or generate returns, and requires a broadening of the tactical portfolio construction process to incorporate tools such as dynamic volatility management, market timing, structured rebalancing policy, alpha-beta split management, and regime switching models.
- ▶ **Just In Case** – This insurance-like mentality involves focusing upon what “could” occur as opposed to what one “expects” to occur. With respect to this bias, we advocate preserving flexibility during times of great stress, and drawing opportunistically from a broad array of potential hedges to produce an acceptable balance between expected cost and potential payoff.

**Key Elements in Tail-Risk Management**

The following is an overview of five key elements that can be considered for tail-risk management.

*Dynamic Volatility and Risk Budget Management*

Asset volatility is like a bad storm. It is forecastable to an extent, it gathers strength, and it can persist for an extended period of time before finally subsiding. These characteristics make it both feasible and prudent to endeavor to maintain target risk exposures at both the portfolio and individual

asset levels. Such volatility management is a form of insurance against the undesirable return experiences, such as equity underperformance, that typically accompany rising volatility (**Figure 9**). This exercise involves reducing allocations as volatility rises and increasing allocations as volatility falls. (Note that this is an asymmetric process in that it is more important to de-allocate or re-allocate during periods of high volatility than it is to over-allocate during periods of low volatility.)

*Latent Hedges*

Certain assets and strategies warrant inclusion in a portfolio not so much because of their average performance profile but because of the protection they afford during tail events. In other words, the “cost” of these insurance policies might be the relinquishment of some expected return. For example, high-quality securities such as Treasuries provide a safe haven during liquidity crises; gold might represent a deflation hedge.

*Tail-Oriented Portfolio Construction*

This involves moving beyond the confines of traditional mean-variance analysis. It involves acknowledging that asset returns do not always follow a normal distribution and bringing a variety of statistical tools and considerations to supplement the portfolio construction process. The objective here is to strike an appropriate balance between the expected payoff to each asset or strategy and the associated tail risk. All things being equal, investments characterized as insurance-providing, negatively skewed, or short volatility (e.g., corporate bonds and carry strategies) must offer a commensurately higher payoff than more normally distributed alternatives or the allocations should be relatively smaller. Similarly, the allocations to fat-tailed investments such as equities may be appropriately lower — again, depending upon the expected payoffs and alternatives.

*Explicit Hedges*

These are typically equity option-oriented tail-risk management strategies expressing a certain stock market loss tolerance. For example, one might purchase long-dated, deep out-of-the-money equity put options to protect a portfolio against a significant stock market decline. Here, the cost is explicit (the option premium) as is the loss to which the portfolio is exposed (function of option strike and number of contracts). Alternatively, one might employ a collar to defray the premium cost by relinquishing some upside. The potential application of options extends beyond the equity market. For example, swaptions could be used in a similar fashion to protect a portfolio against deflation or a significant spike in

inflation expectations. The benefit of such approaches is that they protect a portfolio explicitly from certain conditions. The cost is the out-of-pocket premium, which can feel onerous during lengthy periods of market tranquility. Other hedges may offer a more attractive “cost” profile but do so by introducing outcome and mark-to-market uncertainty. Such alternatives include credit default swaps (company, index, and sovereign), variance swaps, and even the Treasury Eurodollar (TED) spread. Given the potentially significant cost of these hedges and the ever evolving hedging opportunities presented by financial markets, a simple static hedging policy is unlikely to be the optimal answer over time.

#### *Scenario Analysis*

There is no substitute for good old-fashioned thoughtfulness and skepticism when it comes to tail-risk management. Crafting and then respecting portfolio downside scenarios is a rare talent. Crafting these scenarios requires one to balance the plausible with the implausible, to be a student of history while not being bound by it, and to understand the current marketplace with all its interdependencies. Respecting the downside scenarios is difficult because they often appear far-fetched during quiet times, and so one constantly must resist the lure of complacency. But portfolio positions must reflect one’s willingness and ability to weather these potential outcomes. Scenario analysis represents the final sanity check uniting all portfolio construction and hedge related efforts to manage tail risk.

### **Inflation Risk**

Inflation risk should be considered in the context of its effect on both assets and liabilities. How a plan perceives inflation risk will also depend on whether it views risk in an asset-only framework, as is typical for public plans due to their funding and accounting regulations, or in an asset-liability framework, which is more commonly used by corporate plans. (See the discussion of liability risk beginning on page 2 for more information on the differences between these two frameworks.) Periods of rising inflation pose the most risk within the asset-only framework, whereas asset-liability structures experience falling inflation as the greater risk.

#### **Effect of Inflation on Benefit Payments**

A plan’s liability is the present value of its projected benefit payments, in which future inflation assumptions play a key role. Indeed, inflation has its greatest influence on projected

cost of living adjustments (COLAs) and salaries (in a pay-related plan). To the extent that actual inflation is higher or lower than assumed, actuarial losses or gains will result.

Almost all public plans provide a postretirement benefit increase, although the type of increase varies by plan. Consequently, inflation exposure in the liability will also vary. Almost half of large public plans in the US provide an automatic cost of living adjustment that is indexed to the Consumer Price Index (CPI), resulting in direct inflation exposure in their liability, while another 20% provide ad hoc increases, which can still generate inflation risk, particularly if there is a precedent for awarding inflation-indexed increases each year. Most plans with an automatic COLA limit the potential inflation risk by capping the annual increase, typically in a range of 3% to 5%. Another 25% of plans have a flat benefit increase, so there is no inflation exposure in the liability.<sup>3</sup> Postretirement benefit increases are rare among US corporate plans, but are fairly common in the UK and the Netherlands.

For a plan that grants inflation-indexed COLAs, unexpected inflation affects the liability to the extent that the actual inflation adjustment exceeds the assumed adjustment underlying the liability calculation. For example, suppose a plan’s benefit payments are projected assuming future COLAs of 3%. If actual inflation over the next year results in a 5% COLA the following year, then the liability will grow by the difference, or 2%.

Salary increases in pay-related plans affect the liability in the same way as a COLA: that is, the liability is adjusted for the difference between actual and assumed experience. Collective bargaining agreements can be another source of inflation exposure in the liability.

#### **Effect of Inflation on Liability**

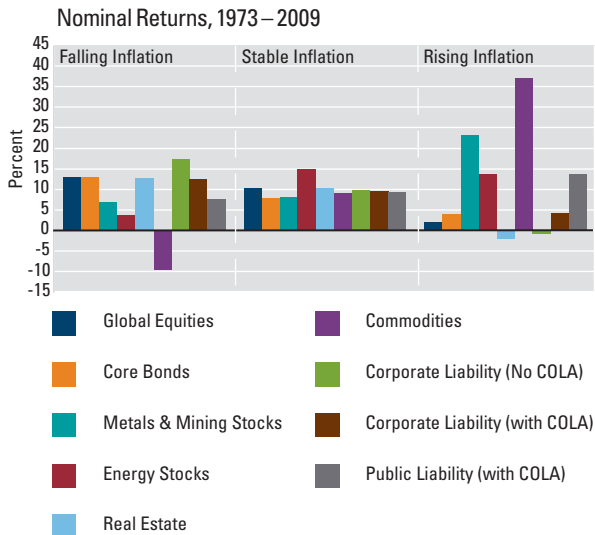
How the effect of inflation on benefit payments translates into the liability depends on whether the liability is viewed in an asset-only or asset-liability framework.

As **Figure 10** shows, when viewed in the asset-only framework inherent in the public plan accounting and funding rules, the average historical liability growth for a pay-related public plan paying an indexed COLA with no cap is 14% in periods of rising inflation, compared to 8% to 9% in periods of falling or stable inflation. Plans that cap the inflation adjustment would have less exposure in periods of rising inflation; for example, during rising inflation periods, the liability is estimated to have grown by 11% if COLAs are

<sup>3</sup>NASRA Public Plan Survey (March 2010)

Figure 10

Deflation/Inflation Risks for Corporate and Public Plans



Stocks: MSCI World Index; bonds: Barclays Capital Aggregate Index; real estate: MSCI World Real Estate since December 1994, DataStream World Real Estate from January 1973 to December 1994; energy: MSCI World Energy Index since December 1994, DataStream World Energy from January 1973 to December 1994; commodities: equal sector-weighted S&P Goldman Sachs Commodities Index.

A rising-inflation period is defined as any month when y/y US CPI rose by 0.3% or more relative to the previous month; a stable-inflation period is defined as any month when y/y US CPI was between -0.3% and +0.3% relative to the previous month; a falling-inflation period is defined as any month when y/y US CPI fell by 0.3% or more relative to the previous month.

Liability and pay-related benefit formula; 12-year liability duration. Liability is 2/3 retiree and 1/3 active. COLA equals 100% of CPI (no maximum). Corporate liability growth is based on PPA liability.

Source: Wellington Management

capped at 5%, and 10% if the cap is 3% or if the postretirement benefit is not indexed to inflation (i.e., only salary increases cause inflation sensitivity in the liability).

Disinflation, rather than inflation, is the primary risk when liability is viewed in the asset-liability framework, as determined by corporate plan funding and accounting rules and, more broadly, the field of financial economics. The discount rate is the main driver of liability changes and typically outweighs the effect of inflation on projected benefit payments. From 1973 to 2008, the PPA funding liability for a

12-year duration pay-related plan without a COLA grew at an average rate of 17% annually in periods marked by falling inflation, whereas liabilities actually declined 1% a year in rising inflationary periods. Although plans with COLAs also experienced higher liability growth in falling inflation periods, the dispersion among inflation environments was more narrow, reflecting the offsetting nature between the discount rate and assumed future COLA.

Because most public plans use a static discount rate based on the long-term expected return on assets assumption, changes in inflation do not affect the discount rate. Public plans that also consider their liabilities in an asset-liability framework, however, may want to consider the relationship between the market-based discount rate and the inflation rate.

Matching Assets in an Asset-Liability Framework

The first section of this paper discussed liability risk and noted that a portfolio of long bonds with the same duration as the liability provides the best liability match within an asset-liability framework. For the portion of the liability eligible for automatic COLAs, duration-matched inflation-linked bonds (ILBs), such as Treasury Inflation-Protected Securities (TIPS), should be substituted for nominal bonds as the liability-matching asset. The liability attributable to COLA-eligible benefits behaves in a manner similar to ILBs: both have cash flows that are indexed to inflation and both are sensitive to changes in real interest rates. A duration-matched ILB portfolio, therefore, provides a hedge against inflation exposure in a plan’s projected cash flows. In addition to ILBs, pension plans can also gain a similar inflation exposure synthetically, through consumer price index (CPI) swaps and CPI futures. Implementation can prove challenging, however, as the long end of the TIPS market is not very deep or liquid, nor is the synthetic market.

Plan sponsors might also ask whether and how they should hedge the inflation exposure related to salary increases. Given the dominance of the discount rate, duration-matched long bonds are still the best matching asset class for the active-lives liability, but plan sponsors might consider adding some inflation-hedging exposure (as described in the next section) within their return-seeking allocation in order to protect against the effect of rising inflation on pay-related benefits, or to provide a reserve for inflation-related benefit improvements in union plans.

### Inflation Hedges in the Asset Portfolio

For plans that view their liability risk in an asset-only framework, which describes how funding and accounting requirements are determined for public plans, inflation poses a twofold risk: it can cause liabilities to increase, reflecting higher COLAs and/or salaries, and, as shown in **Figure 10**, it casts a pall over the performance of core equities and nominal bonds. While a portfolio of duration-matched ILBs provides the best liability match, as discussed above, it would not support current discount rates used by public plans. Yet, as a small allocation within the asset portfolio, ILBs have insufficient inflation beta to protect the larger portfolio (i.e., they only inflation-protect themselves). Given the emphasis on return-seeking objectives in public plan asset allocation, it is important to protect the broader portfolio against periods of rising inflation without sacrificing returns.

There is no single asset type that can protect against all potential varieties of inflation, and thus we recommend a diversified approach that combines attractive inflation-hedging properties of various asset classes. We believe investors should look for three factors in constructing such an approach:

- ▶ Inflation beta: commodities work well in this regard, exhibiting high beta to inflation and therefore providing a volatility-dampening effect on the rest of the portfolio during inflation stress.
- ▶ Long-term return: natural resource-related equities tend to provide higher returns than other inflation-hedging assets and are more correlated to inflation than the rest of the equity market. Again, ILBs are unattractive in this respect because their expected return, at CPI plus the real rate, is insufficient compared to the 8% discount rate used by most public plans.
- ▶ Diversification by inflation regime: inflation-sensitive equities and commodities perform best in high-growth inflation environments, while TIPS and precious metals are best suited to stagflationary regimes.

For corporate plans, inflation-related assets might play a role in protecting against inflation-related salary increases, as discussed above. In addition, these assets can also serve a return enhancement or portfolio diversification role. While corporate plans might feel that they have a natural hedge against rising inflation in that it generally leads to lower liabilities, they might also consider that their core equity exposures are likely

to be challenged in such an environment and that inflation-related assets can play a complementary role. Plans that have a return-oriented asset mix with most of its risk concentrated in equities should consider inflation-related assets as a way to generate returns and improve the funded ratio even further during rising inflationary periods. These plans must take caution, however, as assets with high beta to inflation, such as commodities, are likely to be challenged in disinflationary periods, which is when liabilities are under the most pressure. A basket of diversified hedges that includes equities, commodities, and TIPS — and shifts among them — may alleviate the drag on performance in such environments.

### Counterparty Risk

As pension plan sponsors are well aware, beta exposures can be managed or complemented with synthetic market hedges. Through the use of derivatives, including interest-rate swaps, currency futures and forwards, and asset allocation overlays, beta exposures can be hedged, adjusted tactically, and diversified and balanced across different market environments. The use and proliferation of derivatives, however, introduces a new variety of risk — counterparty risk — which calls for its own unique forms of management.

Counterparty risk is the risk of nonperformance by a counterparty to either a cash transaction or derivatives contract. It is an unavoidable and uncompensated risk that is a byproduct of investing. Thus, while synthetic products enable investors to gain exposures to assets that may otherwise remain inaccessible and establish effective beta risk-hedging positions, they embed an additional form of risk that doesn't carry any commensurate return potential.

Counterparty risk itself is differentiated across derivative transaction types. Exchange-traded futures and options have lower counterparty risk because they are traded through a central clearinghouse, and are backed by margining and daily settlement, clearinghouse minimum capital requirements, and asset segregation. Over-the-counter (OTC) derivatives, such as options, forwards, and swaps, have higher counterparty risk because these transactions are settled directly with the counterparty rather than through a clearinghouse. Similarly, foreign exchange forward contracts, which are privately negotiated transactions that do not settle on an exchange, carry a high level of counterparty risk as parties entering into these contracts cannot rely on any clearing entity to guarantee performance.

When assessing counterparty risk, plan sponsors should be aware of counterparty exposure concentrations that may be present in their portfolios. While counterparty risk cannot be eliminated, it can be managed and reduced by prudently selecting and monitoring counterparties; diversifying exposure to different counterparties; and using standardized legal agreements, such as the ISDA Master Agreement, that contain contractual protections, including bilateral netting, collateral pledging requirements, and limited recourse provisions.

### Liquidity Risk

Until the recent financial crisis, fixed income assets were broadly relied on to provide liquidity regardless of market conditions. But turmoil in 2008 upended long-held assumptions about the asset class as a number of major broker/dealers disappeared and the cost of capital rose dramatically. Liquidity, as many market participants learned the hard way in the wake of the crisis, must be considered a risk like any other, which means it needs to be regarded in explicit terms that quantify the amount of desired versus available liquidity.

In terms of asset allocation, one simple practice for enhancing portfolio liquidity is to dedicate a specific portion of a fixed income allocation to more liquid investments. For example, in working with corporate plan sponsors, Wellington Management typically recommends a long-bond benchmark of 25% to 50% long government securities, with the government allocation serving as a liquidity bucket. Another method employed by some plans is to hold a sufficient amount of cash to meet benefit payment requirements over a defined number of years.

Specific, pragmatic questions about liquidity call for equally specific answers, particularly in periods when liquidity conditions are challenged but liquidity needs are high. If a plan sponsor is trying to fund a portfolio, decision makers want to know how long it will take to be fully invested. If they need to withdraw funds, they want to know whether they can take out, say, 20% of the portfolio value without adversely affecting portfolio performance. And if a plan sponsor is considering investing in a particular strategy, the sponsor needs to understand the liquidity risk it would represent in the portfolio. At Wellington Management, we evaluate these questions with our Liquidity Evaluation Framework (LiEF), a proprietary tool that enables us to determine liquidity risk at the portfolio level, and in relation to specific issues, issuers, and industries. Even when liquidity

appears all but absent, LiEF helps us discern degrees of liquidity's presence, which then helps frame realistic expectations for portfolio liquidation and funding.

### Currency Risk

Currency is a different type of asset class from those typically held in pension plan portfolios. First, there is no natural long-term economic return associated with holding foreign currencies, whereas stocks offer a long-term natural return that results from dividends and earnings growth, and bonds provide compensation through interest rates. Nevertheless, foreign currencies are quite volatile. For a US investor, the MSCI EAFE basket of currencies had an annualized volatility of 10% between 1985 and 2009. This compares to an annualized volatility of 17% for US stocks and 5% for US bonds.

Currency exposure often arises as an unintentional consequence of holding other investments, namely international stocks and bonds. It is relatively easy and inexpensive to remove, or hedge, most of the currency risk in a portfolio using currency forwards. Forwards on the major currencies are among the most liquid financial instruments in the world, and the transaction costs of trading them are minimal. For some smaller countries and for the emerging markets countries, however, transaction costs can potentially be more significant.

Despite these factors, plan sponsors might find it beneficial to hold some currency exposure in their portfolios. One reason to hold currencies is for diversification. What is not commonly understood is that, historically, some level of currency exposure in equities and/or fixed income has at times reduced overall asset volatility for US plans. This volatility reduction is driven by two factors. First, equity market risk tends to dominate the currency exposure, muting the effect of the currency volatility. (This relationship is different for fixed income, however, where currency risk dominates.) Second, the correlation between US assets and non-US currency returns tends to be diversifying, which can offset the currency volatility and consequently reduce volatility at the total portfolio level.

### Hedging Currency Exposure in Equities

For a portfolio of 65% US equities and 35% US bonds (65/35), **Figure 11** shows how adding a developed international stock portfolio in increments changed the portfolio's volatility, where the international portfolio was hedged,

partially hedged, or unhedged. Initially, the addition of the international portfolio reduced volatility because of the diversification effect of the non-US exposure, regardless of hedging strategy. Continuing to add to the unhedged portfolio beyond a 10% allocation, however, caused total portfolio volatility to increase, whereas with the hedged portfolio, the total portfolio's volatility continued to decline up to an allocation of 20%.

Whether lower portfolio volatility will result from a hedged or an unhedged international allocation depends on both the volatility of the hedged versus unhedged international exposure and the correlation between the foreign currency and US equities, which is typically diversifying but to varying degrees. These relationships change over time, causing a hedged portfolio to have lower volatility than an unhedged portfolio in some periods, but higher volatility in others. Historically, hedging currency only partially has provided more consistent volatility reduction in the face of these changing relationships. Over the 1985 – 2009 period shown in **Figure 11**, diversification between non-US currency returns and US equities provided only modest volatility reduction and was not enough to offset the higher volatility of the unhedged non-US stocks.

In some historical regimes, however, the currency diversification benefit has been more powerful. For example, **Figure 12** shows this same analysis from 1985 through 1999, a period marked by negative correlations between non-US currency returns and US equities. Here, the unhedged portfolio generated lower volatility at the total portfolio level for international equity allocations up to 25%. In both time periods, however, a portfolio in which the non-US exposure was 50% hedged compared favorably.

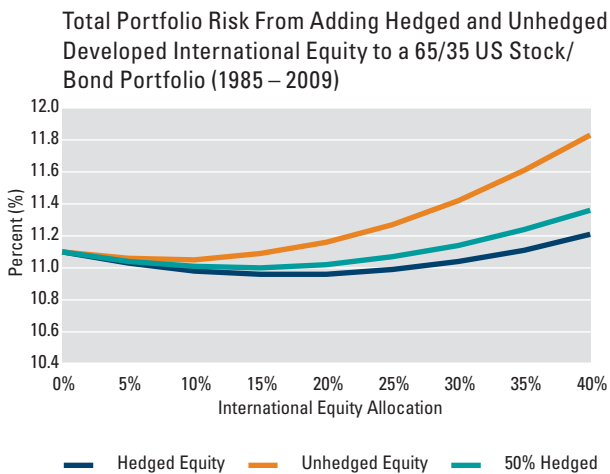
In general, hedging versus not hedging results in a modest difference in volatility, as equity volatility dominates the currency exposure.

**Hedging Currency Exposure in Fixed Income**

Many investors hedge currency exposure in their non-US fixed income holdings because of the dominant effect that currency has over the underlying fixed income volatility (unlike equities, where equity volatility dominates). As **Figure 13** shows, however, at small allocations, an unhedged non-US bond portfolio resulted in the same to nominally lower volatility when non-US exposure was substituted for US fixed income in a 65/35 portfolio. At larger allocations,

**Figure 11**

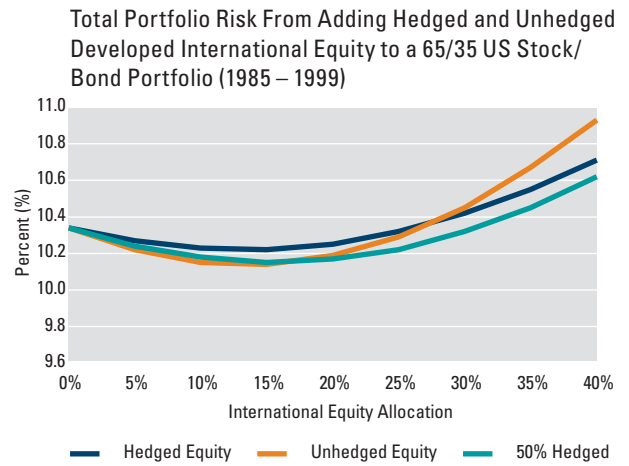
**Hedging International Equities Has Greater Effect at Higher Allocations**



Sources: MSCI EAFE (developed international equity); S&P 500 Index (US stocks); Barclays Aggregate (US bonds)

**Figure 12**

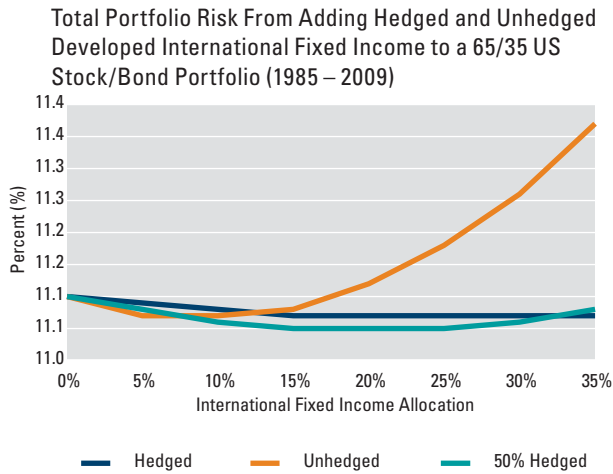
**Partial Hedging Has Produced More Consistent Volatility Reduction**



Sources: MSCI EAFE (developed international equity); S&P 500 Index (US stocks); Barclays Aggregate (US bonds)

Figure 13

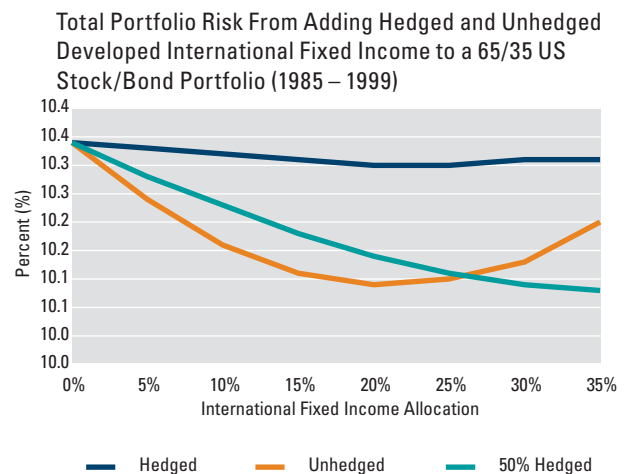
**Hedging International Fixed Income More Important at Higher Allocations**



Sources: S&P 500 Index (US stocks); Barclays Aggregate (US bonds); Citigroup WGBI (developed international bonds)

Figure 14

**Partial Hedging Is Favorable for Fixed Income Allocations As Well**



Sources: S&P 500 Index (US stocks); Barclays Aggregate (US bonds); Citigroup WGBI (developed international bonds)

the volatility of the currency exposure dominated, eventually causing volatility of the unhedged portfolio to exceed the level for the initial all-US portfolio.

As with equities, a different relationship held in 1985 – 1999, when currency diversification dominated the higher volatility of the unhedged non-US fixed income exposure, resulting in lower volatility for an unhedged non-US bond allocation. As with the preceding analysis for adding international equities, a partially hedged portfolio results in a favorable volatility profile across both time periods (Figure 14).

**Additional benefits of currency exposure**

In addition to the modest potential volatility reduction at the total portfolio level, there are several other reasons for establishing currency exposure that plan sponsors might consider:

- ▶ A negative long-term outlook on the domestic currency: for example, if one expected a long-term depreciation of the US dollar, a policy allocation to non-US currencies may offer attractive return potential.

- ▶ A hedge against US inflation: to the extent a plan has inflation-indexed cost of living increases or other inflation-related exposures in its benefit structure, some non-US currency exposure might be beneficial as an increase in US inflation reduces the purchasing power of the dollar versus non-US currency.
- ▶ Active management: some investors view currency exposure as an expansion of the opportunity set within which active managers can add value.

**Conclusion**

As we know from the experience of 2008, moments of crisis can bring certain risks dramatically into focus for the first time, even for sophisticated investors. In the foregoing summary, we have endeavored to help plan sponsors understand the full spectrum of risks facing their plans. As they continue to evaluate these risks in the context of their plan, we hope this guide facilitates the exploration of specific risk management solutions that can still enable the strong pursuit of plan objectives.



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