

Tail Risk Hedging: A Roadmap for Asset Owners

Deutsche Bank Pension Strategies & Solutions

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*"We took risks. We knew we took them.
Things have come out against us.
We have no cause for complaint."
- Robert Frost*

*"It is often said that [one] 'is wise who can see things coming.'
Perhaps the wise one is the one who knows
that he cannot see things far away."
- Nassim Taleb*

Mounting Tail Risk Concerns

Following the traumatic events of the last two years, risk and its management have become the most visible subject within the asset owner world. As part of the management of the risk, tail risk hedging has taken center stage.

This paper aims to provide a clear, step-by-step guide to the process of hedging tail risk across many asset types. We hope that it is able to provide useful examples, common-sense solutions, and advantage/disadvantage analysis of various approaches. We have made every effort to make its content clear, concise, and useful. Although Deutsche Bank Global Markets does not act in a fiduciary capacity and this document is provided for informational purposes only, we hope that it can serve as a positive step toward helping our clients make informed decisions.

Please do not hesitate to contact us if you have questions.

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Defining Tail Risk

Tail risk is technically a risk of a portfolio value move of at least three standard deviations (3σ) from the mean and is more probable (frequent) than anticipated by a normal distribution.

However, the recent surge of interest in this topic has not remained limited to this precise definition, but instead has driven the use of the terminology to refer to the possibility of generic rare events. Since every dataset can be roughly characterized by a distribution (e.g., Normal, Poisson) that is in turn characterized by mean, standard deviation, etc., identifying the specific relevant dataset is important.

The emergent nebulous meaning of the term “tail risk” is not entirely invalid, but need be better framed. In the context of this document, a functional meaning is used: in essence, tail risk is the risk that a large move in a portfolio is greater than what is implied by traditional risk management theories (without implying an expected severity of the event, such as 3σ or 6σ).

With this framework, we therefore use the term “tail risk hedging” to refer to the creation of positions within a portfolio that are created to protect against downward market moves.

Hedge Selection Process

With the wide array of tail risk hedges available, it is integral to develop a systematic strategy for selecting products and building a hedge portfolio. There are three fundamental steps, each of which presents a series of questions that have been formulated to help an asset owner successfully navigate the tail risk hedging decision process.

1. **Analysis:** Begins with a review of portfolio factors/exposures and a determination of the desired portfolio behavior and constraints to which a hedge would be subject. This step includes discussion of hedging parameters—such as estimated event probability and asset class—as well as suitability and cost tolerance analysis.
 - *What are we hedging?* Page 3
 - *Active hedging or diversification?* Page 4
 - *What hedging instruments may be appropriate?* Page 5
2. **Synthesis:** Involves hedge selection and bespoke solution construction, pre-trade monitoring, legal and operational review, cost analysis, and execution.
 - *What are the costs of hedging?* Page 7
3. **Monitoring:** Monitoring includes quantifiable review of trade impact and of the suitability of choosing to monetize or unwind instead of continuing to hold the hedge. The supervision level and monitoring frequency required will also affect instrument selection. For example, if daily monitoring is necessary, then illiquid bespoke solutions may not be ideal.
 - *What are my monitoring constraints?* Page 8

For convenience, we have created a Tail Risk Decision Table (Table 3), which can be found on page 16*.

* Some hedge types mentioned in Table 3 are not explicitly discussed elsewhere in the paper. Please contact us to discuss.

What are we hedging?

Asset Hedging

With a working definition of tail risk in hand, an asset owner must decide on the degree of hedging desired. Is the hedge to be placed at the single instrument level (e.g., too much Microsoft exposure), theme/sector level (e.g., too much exposure to tech), asset class level (e.g., too much Beta to S&P 500), or portfolio level (e.g., too much exposure to equities)? Usually this is the hardest question, but its answer begins with a simple look at the portfolio and its makeup. It is assumed that asset owners have a good understanding of the risks in their portfolio either quantitatively—which is preferred—or qualitatively, which is more commonly the case. For reference, average Defined Benefit portfolio allocations are roughly similar to Table 1 below.

Table 1: Sample Defined Benefit Plan Allocation

Asset Class	Target
Domestic Equity	40%
International Equity	10%
Domestic Fixed Income	30%
International Fixed Income	2%
Private Markets (includes Hedge Funds)	10%
Real Assets (TIPS, Commodities, etc.)	5%
Cash	3%

If the choice is made to hedge at the asset level, which is usually the case, then the first decision to be made is which subset of the portfolio needs hedging; the conclusion tends to be equities, specifically S&P 500 equities because they typically represent the largest allocation within the portfolio and have been historically one of the most volatile and most easily hedgible. Other portfolio

subsets being considered by asset owners to be hedge candidates include EAFE[†] portfolios (which run the risk of USD run-up), inflation (which impacts both fixed income and liabilities), and some real assets (which could be susceptible to real estate collapse).

Liability Hedging

A more complete analysis of hedging tail risks expands the asset-only paradigm to include liabilities. For example, a deflationary environment is crippling to pension plans as decreasing rates increase the value (and cost) of liabilities. This can have a tremendous negative effect on plan solvency, contribution requirements, and financial reporting. Additionally, some investor types, such as public pensions and endowments, often have liabilities tied to inflation. These types of risks should be identified and analyzed and appropriate hedging solutions should be considered.

[†] Europe, Australasia, Far East

Active Hedging or Diversification?

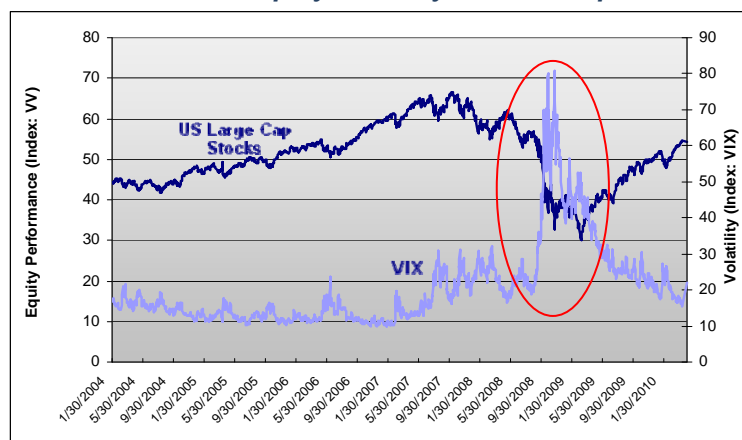
With a target portfolio subset in mind, the asset owner must now decide whether to pursue active hedging or to diversify allocation in order to broadly decrease portfolio risk. In the context of this paper, active hedging is defined as the act of adding positions that neutralize specific risk types within the portfolio, and diversification is an income investment that lowers portfolio risk due to lower correlation between asset classes. This decision will hinge on the firm’s constraints, asset allocation guidelines (such as the preexistence of a commodity allocation), legislative or corporate governance issues (for some plans, derivatives are prohibited), liquidity of the hedge market (equities are generally more liquid than corporate credit), and expected severity of “tail event” (e.g. 3σ or 5σ event).

Table 2: Correlation Matrix

	US Bonds (AGG)	Commodities Index (DBC)	US Real Estate (VNQ)	Europe, Australasia, Far East (EFA)	US Large Cap Stocks (VV)	Inflation-protected Treasuries (TIP)	Volatility (VIX)	Managed Commodity Futures (DBMatrix)
US Bonds (AGG)		0.07	0.31	0.38	0.27	0.76	-0.28	0.00
Commodities Index (DBC)	0.07		0.34	0.55	0.49	0.45	-0.27	-0.02
US Real Estate (VNQ)	0.31	0.34		0.77	0.84	0.27	-0.47	-0.33
Europe, Australasia, Far East (EFA)	0.38	0.55	0.77		0.93	0.39	-0.63	-0.15
US Large Cap Stocks (VV)	0.27	0.49	0.84	0.93		0.34	-0.65	-0.25
Inflation-protected Treasuries (TIP)	0.76	0.45	0.27	0.39	0.34		-0.26	-0.11
Volatility (VIX)	-0.28	-0.27	-0.47	-0.63	-0.65	-0.26		0.00
Managed Commodity Futures (DBMatrix)	0.00	-0.02	-0.33	-0.15	-0.25	-0.11	0.00	

For example, if the portfolio does not yet include commodity exposure, a straightforward means to diversify the portfolio is by either adding a passive commodity allocation via an index such as Deutsche Bank’s flagship commodity index DBC, or via an active managed futures allocation such as the DB MATRIX index. Historically, commodity indices have had a low correlation to the portfolio and therefore represent a good diversifier. Managed commodity futures have exhibited a negative correlation to equities and naturally increased diversification. In Table 2 above, the correlation between managed commodity futures and other asset classes has been shown to be zero to negative[‡].

Chart 1: Equity/Volatility Relationship



[‡] The asset correlation matrix shown in Table 2 was constructed using Bloomberg month-end closing prices for the period during which consistent data is available for each instrument: March 2006-April 2010. The correlation of instruments with data extending earlier hold roughly consistent to the correlations in the table. Where applicable, the previous day’s closing price was used on holidays for which data was not available, in order to facilitate correlation calculations.

Although diversification is a valuable portfolio management tool, hedges may not hold their characteristic correlation profiles under extreme market conditions. In order to hedge these extreme tail events, an asset owner can choose to actively hedge the portfolio. For example, an asset owner can purchase protection against volatility spikes, which have frequently occurred in conjunction with declining equity markets (see Chart 1[§]). At the trough of the 2008-2009 downturn, the VIX index, a measure of S&P 500 index short-term volatility, peaked at 80. At the time of this writing, the VIX is in the low 30's, with a correlation to US large cap equities of -0.65, as can be seen in Table 2. Note that this table also shows that the VIX has exhibited historically strong negative or low correlation to the other asset classes.

Although direct investments in the VIX are generally expensive or fraught with basis, there do exist many efficient methods for protecting against volatility spikes. These methods are addressed further in the Hedge Examples section on page 11.

What hedging instruments may be appropriate?

Hedge vehicle selection is dependent on many factors, the most important of which is whether the firm is a “manager of managers,”** or has in-house hedging/overlay/trading rights, which in legal parlance is referred to as an In House Asset Manager or INHAM.

If the asset owner is not an INHAM, then direct hedging instruments may not be permissible and all hedging or overlays should be performed via Qualified Plan Asset Managers (QPAM), subject to an RFP process.

INHAM/QPAM issues notwithstanding, the selection of a hedging vehicle depends on several factors, listed below.

Are derivatives allowed in the portfolio?

Many plan sponsors currently do not directly trade derivatives in their portfolio, due to portfolio guidelines and/or the individual state laws that govern public plans.

Recently, as markets have generally become more sophisticated and liquid, pensions and their consultants have begun to consider and advocate for derivatives in their portfolios. The desire to gain access to some asset classes via derivatives has aided acceptance of derivatives, but only to a certain degree. While investment in managed futures or in long/short equity hedge funds have been accepted, pure option strategies and investment in illiquid assets are generally still shunned. The current regulatory pressure on derivatives is unlikely to affect plan sponsor usage in the short- or medium-term.

[§] Chart 1 data compiled from VIX and VV daily prices, as published on Bloomberg

** Many pension plan sponsors outsource the specific asset management function and concentrate their efforts on selecting the managers for each asset class.

Is leverage allowed?

Many plan sponsors similarly limit the use of leverage within their portfolios. Although 'leverage' is not well defined in this context, for those plan sponsors who may be restricted from using leverage, it is generally accepted that leverage consists of:

- Direct borrowing in the form of credit facilities (sometimes permissible)
- Using short sale proceeds to fund long purchases
- Embedded leverage that is inherent in certain financial products such as futures, options, and structured products

Rules and regulations concerning these concepts are generally stricter for ERISA entities and sometimes less strictly defined for some allocation buckets (such as is often the case for Hedge Fund investments).

Asset owners should confirm and clarify applicable derivatives, leverage, and other restrictions with their legal counsel.

What are the horizon and the expected rarity of the event to be hedged?

Plan sponsors need also determine the optimal trade horizon. This must be considered in the context of the portfolio's horizon, whether it be strategic or tactical, but in either case, the implementation of the solution is dependent on the type and availability of instrument expiries and maturities. For instance: if the selected instrument is an equity option, a different set of considerations apply than if a direct index investment is selected. In the case of equity options, one must consider expiry of the underlying options (as well as structure and the number of options required to achieve the desired effect), but indices usually do not have an expiry.

Similarly relevant is one of the most spoken-about characteristics of statistical distributions, σ . In essence, the larger the number of sigma, the more rare an event is (a 6σ event is more rare than a 3σ event). Depending on the market conditions of the portfolio subset that is being hedged, an economic decision about σ has to be made vis-à-vis cost (more on this a bit later).

For instance, if an asset owner chooses to hedge its equities book (S&P 500) with volatility, it can do so via variance swaps, tail risk protection indices, or index swaps. More information on each of these is available in the Hedge Examples section on page 11.

What are the costs of hedging?

Most of the factors mentioned in the previous sections affect overall cost, which is often the asset owners' primary consideration. Cost analysis is not simple, and understanding the factors that affect it is important. These factors include:

Timing: In relatively calm markets, implied volatility is low. Consider options on the CDX.IG index (an index linked to 125 investment grade corporate credits): the cost of CDX.IG index options, which is partially comprised of volatility premium, is less when the credit market is calm than it is in turbulent times. The 2009-2010 credit market rally has created market stability that may present a good opportunity to purchase protection. Asset owners need to be aware of market timing context when placing a hedge.

Liquidity: Liquidity is a measure of market depth and of how quickly and reasonably an asset can be bought or sold without significantly affecting the market. Various assets differ in their liquidity: S&P 500 index constituent stocks, with a heavy trading volume, are for the most part more liquid than those listed on the Toronto Stock Exchange. Usually a thinner trading volume demands a higher transaction cost. This relationship is also prominent in the Over-The-Counter (OTC) vs. Exchange-traded discussion.

Horizon: The period of time during which a hedge would need to be in effect is the hedge's time horizon. This concept is closely tied to both the timing concept and to liquidity, and by extension, longer-dated solutions are frequently more expensive. That said, for some instruments, a sufficiently long maturity/expiry may not be available. For longer-term strategies, consider index investments, which have no maturity. For a shorter horizon, options on the VIX—which extend expiry seven months into the future—may be more economically appropriate.

Trade Size: Dependent on trade mechanics, trade size can either significantly increase or categorically decrease transaction costs. When operating in the CDS market, for example, larger notional value can affect relative liquidity dramatically and increase cost. In the case of a highly customized structured solution, larger notional value allows for economies of scale and reduces per-unit cost.

Funded vs. Unfunded Instruments: A major determinant in the cost of a hedge will be whether the instrument chosen is a funded or unfunded vehicle. Products can be fully funded, require only a small premium payment, or in some cases only require an initial margin amount. We have illustrated this property in Table 3(a), where we represent the cash outlay of each hedge instrument by employing a relative measure indicator (“\$” requires less cash outlay than “\$\$”).

Structure Complexity: A solution may be simple and comprised of only one instrument (e.g., put option on the S&P 500) or more complex and be created from a series of individual

instruments (e.g., option collar on S&P 500). Often these more complex structures are created to diffuse cost, such as in the case of an option collar on S&P 500, which can involve buying a put option and offsetting the cost of the put by selling a call option. This kind of solution sheds cost at the expense of some hedging efficiencies. In addition, there are some bespoke solutions that increase structural complexity in order to achieve an economic purpose—such as a bespoke credit default swap basket trade. This trade would be similar to buying protection on the CDX.IG index (which references 125 companies) except that the bespoke swap references an investor-picked subset of companies (e.g. 70–80 preferred companies). Typically bespoke solutions such as these are more expensive.

Service Provider Factors: The following parameters affect the cost of any proposed solution:

- **Scale:** Larger providers can afford more economies of scale, especially if they are a market maker. Those with a broad geographical reach can also leverage product diversity, market expertise, and operational efficiencies.
- **Counterparty credit/rating:** More highly-rated entities' ability to borrow at a lower cost translates to potential savings for their clients.

What are my monitoring constraints?

Monitoring is observation and evaluation by a system or person. Before implementing a hedge, it is critical to consider the operational burden caused by the necessity of monitoring the hedge. Proper monitoring should address whether the hedge is performing as expected, ensure that it is not nearing its expiry/maturity timeframe, and determine whether market conditions call for the termination of the position. When discussing monitoring, consider:

Frequency: In general, positions should be monitored as frequently as possible—but monitoring frequency must also be evaluated on a case-by-case basis. For less liquid instruments, daily monitoring may not be possible, as their reported price often does not change as frequently. In the case of an asset owner that is an INHAM, the appropriate existing trading team often includes this task in its responsibilities.

Metrics: Several metrics must be considered in order to ensure that monitoring efforts are sufficiently thorough:

- **Price/Mark-to-Market:** Change in price is the most important indicator of how an instrument/strategy acts as a hedge.
- **Volume:** As an important indicator of liquidity, changes in volume must be monitored as diligently as changes in price. Past experience has shown that liquidity shrinks dramatically during extreme market events.
- **Efficiency:** It is recommended to monitor hedge effectiveness and periodically reevaluate assumptions. Simple measures such as total portfolio value or complex measures such as Value-at-Risk are widely held to be acceptable methods for measuring efficiency.

Tools: Asset owners should consider their technical limitations or strengths in the context of monitoring to ensure that monitoring can be performed properly.

- **Price:** Although most pricing levels are reported by market data services, some asset prices can only be obtained from broker/dealers. In the case of these assets, a relationship with a broker/dealer is critical.
- **Portfolio:** Portfolio monitoring tools to measure hedge effectiveness are available commercially, or often, service providers can offer reports or the use of proprietary portfolio monitoring tools upon request – be sure to ask.
- **Collateral:** Aspects of monitoring collateral are also subject to specialized systems often provided commercially.

Collateral: Some instruments, such as swaps, require careful monitoring to ensure proper collateral calculation and exchange of credit/debit between counterparties. There are also many products suitable to tail risk hedging that do not require the exchange of collateral. If collateral monitoring is operationally implausible, the asset owner should consider alternative solutions. Custody banks can typically provide this monitoring service.

Counterparty: It should be remembered that counterparty risk can quickly become an issue in a tail event scenario. This consideration is more relevant in the case of hedges that do not clear through an exchange, but asset owners must be cognizant of news and happenings that may affect their counterparties adversely. The most straightforward ways to reduce idiosyncratic counterparty risk is to face the most highly rated counterparties and to diversify counterparty exposure.

Risks

Before a solution is implemented, it is worthwhile for the asset owner to be aware of the spectrum of risks inherent in their decision. These risks are summarized for each type of solution in Table 3(b). For example, an equity option collar has equity risk, nonlinearity risk because it's a collection of derivatives, operational risk because it needs to be rolled before or at expiry, and some career risk for the CIO/decision maker if hedges dramatically underperform expectations.

Relevant risks include, but are not limited to:

Market risk: Also known as systemic risk, this is the risk that is common to an entire market system. The value of investments may decline over a given time period simply because of economic changes or other events that impact the market at large.

Non-linearity Risk: Potential losses on derivative positions that are due to a non-linear relationship between the price of the derivative and the price of the underlying instrument that the derivative references.

Credit Risk: Potential losses associated with the ratings upgrade, ratings downgrade, restructuring, or default of a reference entity. Recovery rates in the event of each of these influence credit risk as well.

Counterparty Risk: The risk to each party of a contract that their counterparty will fail to fulfill its contractual obligations. Counterparty risk is a risk to all involved parties and should be considered when evaluating a solution. The importance of considering this risk has increased in the wake of the unexpected failure of several broker/dealers.

Operational Risk: Potential losses associated with the execution of an investor's systems, processes, and personnel. This includes trading risk, fraud risks, legal risks, physical risk, and environmental risks. In this context, operational risk refers to the risk inherent in the process of hedging (analysis, synthesis, and monitoring), and the complexities that result from hands-on management.

Career Risk: Loosely defined as potential for loss of professional credibility of the CIO/decision maker due to an adverse outcome of hedging decisions. An individual who follows a reasoned, conservative decision-making process should be able to deflect career risk.

Hedge Examples

As a supplement to Table 3, included here are brief illustrations of a few strategies that can be implemented to effectively hedge tail risk scenarios tied to specific asset classes. Asset owners should consider whether any strategy is allowed or appropriate before implementing.

- Variance Swaps
- Tail Risk Protection Indices
- Equity Option Strategies
- Credit Strategies
- Inflation Floor Agreements
- Inflation Hedge: Energy Indices
- Managed Futures Indices
- Sovereign Risk Commodity Hedge
- Sovereign Risk Rates Hedge
- Swaps on Indices

Variance Swaps

A variance swap is an over-the-counter financial derivative that allows one to speculate on or hedge risks associated with the magnitude of movement (volatility) of some underlying product, such as an exchange rate, interest rate, or stock index. In a variance swap, two parties enter a contract on forward realized variance. At maturity it pays the difference between the realized variance and the pre-agreed variance strike. Variance swaps provide pure exposure to the underlying price volatility, without the complication of delta risk, which is present in options. The implementation of variance swaps requires in-house expertise in order to analyze inclusion and sizing given a portfolio.

Tail Risk Protection Indices

Volatility-based tail risk protection indices are rapidly becoming a popular choice as overlay equity tail risk hedges. Deutsche Bank's ELVIS index is one such example. ELVIS uses forward variance swaps to effectively go long S&P 500 implied volatility, which avoids the otherwise necessary volatility "risk premium" embedded in option prices. Historically, periods of severe losses in the equity market have been met with upward spikes in volatility, qualifying the index as an appropriate and effective tail risk hedge. Adding DB ELVIS grants a portfolio substantial downside protection while minimizing carrying costs during healthy market periods. Contrary to many other strategies, ELVIS does not require active management to maintain protection—which alleviates operational burden associated expiration/rolling—and is structured in a simple and transparent manner.

Deutsche Bank's EMERALD index performs in a similar manner, with a different structure. DB EMERALD seeks to capture returns based on the S&P 500's demonstrated tendency to mean-

revert during the course of a single week, essentially generating returns while providing downside protection. The performance of the index is tied to the spread between “daily” volatility and “weekly” volatility, which has displayed consistent negative correlation. DB EMERALD’s advantages are similar to those of DB ELVIS: low cost of carry, no need for active management, simple and transparent structure, and efficiency in hedging equity risk. It is important to note that both indices rely on the persistence of the historic negative equity-volatility relationship to perform as anticipated.

Equity Option Strategies

Traditional put option strategies are among the most straightforward approaches to actively hedging equity risk, and are also among the most effective if implemented properly. Historically, long-dated 70% strike puts on the S&P 500 have been a popular choice, since options are illiquid at strikes below 70%, and therefore generally more expensive. This put strategy is comparatively cheap, moderately liquid, and effective in severe market downturns. Operational drawbacks include cost volatility, additional fees associated with rolling the position, and the necessity to monitor positions around expiry/roll period.

Employing tailored option strategies involves combining puts and calls, and in some cases over-the-counter instruments, to develop a specific hedge profile. Put spreads and put-call collars are created to diffuse cost. Consider an option collar on S&P 500, which involves buying a put option and offsetting the cost of the put by selling a call option. This kind of solution sheds cost, but at the expense of some hedging efficiencies. Additional features can be structured to allow an investor flexibility to tailor the hedge to any particular market outlook. Relative to traditional put options, tailored option strategies are inherently more complex, require more careful monitoring, and can be less liquid.

Credit Strategies

There are four credit hedging instruments that are commonly available:

- Credit default swaps (CDS) on individual issuers: For example, “buy five-year protection on GE default”
- CDS indices: CDX.IG (investment grade) and CDX.HY (high yield) are the major available indices in US corporate credit. There is also a liquidly traded index that addresses Sovereign risk.
- Options on CDS indices: Options are available on the CDX.IG index
- Tranches (slices of varying seniority) on CDS indices: Tranches are liquid on CDX.IG and CDX.HY

CDS on individual issuers is used to express a bearish view on or hedge exposure to specific names, or sets of names (perhaps a sector). This approach is less appropriate for “macro” hedging or tail risk hedging except when the issuer itself is a systemically important / tail risk sensitive entity – for example, buying protection on financials, insurance companies, and sovereigns have been used as tail risk hedges in the past.

The most liquidly traded US CDS index is the CDX.IG, which references 125 investment grade corporate credits. This is an active strategy that facilitates straightforward and transparent exposure to the CDS market. Options on CDS indices allow investors to buy call or put options on movements of the CDS indices – these can be used to create non-linear payoff profiles, with relatively low cash outlay, that are often desirable in the context of tail risk hedging.

Hedgers can also buy protection on specific slices of the index via the tranche market. CDX.IG tranches are available in slices of varying seniority. Each tranche has different sensitivities to idiosyncratic default risk, economic downturn risk, and tail risk which allows for fine-tuning to obtain the desired exposure. To determine the most appropriate slice given desired payout, risk profile, and market conditions, we urge asset owners to discuss the topic with their trusted advisors. Hedging with CDX is low-cost, and is more liquid than purchasing CDS on individual names. Historically, over the long term, CDX hedges had underperformed other credit hedges, and might be better suited for shorter term (or more frugal) hedging purposes. Bespoke solutions can also be created to immunize a client portfolios exact tail risk profile.

For corporate pension plan sponsors looking to add credit as part of an LDI (liability-driven investment) strategy, selling protection on individual credits or indices may prove an efficient means to achieve this result.

Inflation Floor Agreements

To hedge against the problem of increased underfundedness in a deflationary environment, an asset owner can purchase options that are structured to compensate the owner precisely when this becomes a concern. Inflation floor agreements are structured to pay at maturity if the cumulative inflation over the life of the contract is less than the strike. Inflation floors perform optimally in deflationary scenarios lasting multiple years or in select years that exhibit severe deflation. Inflation floors must be rolled periodically—and hence require operational diligence to maintain protection—and are among the more involved strategies available to achieve tail risk hedging. Cumulative inflation floors are best used as portfolio-level hedges.

Inflation Hedge: Energy Indices

Financial assets such as equities and bonds face the risk of loss from an unexpected increase in the rate of inflation, which affects the rate at which cashflows are discounted. Hedging unexpected inflation can be performed in numerous ways, but because a significant component of these unexpected changes has historically been driven by food and energy prices, a swap on a targeted commodity index may prove an efficient and liquid method of achieving this hedge. We recommend a long-only investment in the DB Optimum Yield Energy Index as a hedge against unexpected inflation.

Managed Futures Indices

As discussed, an investment in managed commodity futures can serve to hedge equity risk through diversification. An example of such an investment vehicle is Deutsche Bank's MATRIX index, which provides this exposure by referencing a basket of commodity trading advisors (managers). Managed futures have exhibited exceptional performance over other alternative strategies during periods of severe market stress, and demonstrate a real diversification benefit during these periods. Initial cash outlay for DB MATRIX is low if traded via swap, and this strategy comes with low operational overhead since there is no need to roll or rebalance.

Sovereign Risk Commodity Hedge

In the event of a sustained and widespread sovereign risk spillover in Europe, the markets should pursue "flight to safe-haven" assets such as Gold, followed by a reduction in capital expenditure and economic growth, which would be reflected in lowered demand for industrial commodities such as Aluminum and Crude Oil. To protect against such sovereign risks, we suggest buying a worst-of option including a call on Gold, a put on Crude Oil, and a put on Aluminum. This portfolio overlay strategy has a very low premium (typically ~95bps for a 1-year option struck 5% out of the money) with max loss limited to the premium paid.

Sovereign Risk Rates Hedge

In a sovereign risk spillover event, a low USD rate environment would likely prevail. To position against this scenario, managers can purchase a low-strike receiver swaption in USD as a hedge. This option gives the buyer the ability to enter into a contract in which he receives a fixed rate while paying a floating rate (typically 3-month Libor). If a low USD rate environment ensues, the buyer of the option will profit as he owns a contract that entitles him to payments at above-market rates.

Hedging Liabilities with Options

As discussed in "What are we hedging?" on page 3, a deflationary environment is problematic for pension plan sponsors. A plan sponsor can use swaption strategies such as the Sovereign Risk Rates Hedge above to protect funded status from a declining rate environment. These strategies can be customized to an investor's time horizon and desired cost structure.

Longevity Swap

As the peak of the baby boomer retirement wave approaches and retirees continue to live longer, markets are developing hedging solutions to help pension plans manage the volatility of their liabilities. One targeted approach is via a swap that effectively hedges benefit payments beyond projected life expectancies. In the swap, sponsors pay a fixed stream of payments (determined at the inception of the longevity hedge and representing the best estimate of projected payments to pensioners plus a margin) and receive any actual payments owed to pensioners. This reduces the sensitivity of the plan to changes in the life expectancy of its members. This opportunity exists due to the recent growth and maturation of the longevity market, as well as the emergence of new market participants who seek longevity exposure.

Swaps on Indices

Swaps are an effective way to realize the performance of an underlying index, such as DB ELVIS, DB EMERALD, DB MATRIX, or DBLCI (the DB Liquid Commodity Index) without the drawbacks of using balance sheet. The swap structure is simple to understand and to enter. By paying a negotiated rate—typically a fixed spread over Libor—and receiving the realized performance of the index, equity tail risk protection is gained with minimal capital committed. Drawbacks of using swaps can include compromised liquidity, necessity to negotiate ISDA agreements with the service provider, and the necessity to roll forward contracts as they expire. Other more complex variations (e.g., notes) can also exist.

Table 3 (a): Asset Tail Risk Hedging Decision Table – Considerations

What are we hedging?	Active hedging or Diversification?	What risk do we hedge?	What do we hedge with?	Other PF Constraints								
				Instrument	Cash Outlay	Liquidity	Are you an	Can you use a	Derivative	Leverage	How Far	Expected
							INHAM?	QPAM	s allowed in PF?	Allowed?	on tail?	Horizon
(Y/N)	(Y/N)	(Y/N)	(Y/N)	(?? σ)	(?? Yrs)							
Domestic Equity	Active	Downturn / Volatility	Eq Option Collar	\$	★★							
			Variance swaps	\$	★							
			Index EMERALD	\$	★★★							
			Index (ELVIS)	\$	★★★							
			Options on VIX	\$\$	★★							
International Equity	Active	Downturn / Volatility	Eq Option Collar	\$	★★							
			Variance swaps	\$	★							
		FX Risk	FX Option	\$\$	★★★							
			FX Index (MSCI EAFE FX HEDGE index)	\$	★★★							
Treasuries	Active	Inflation / Rate Increase	Payer swap	\$	★★★★							
			Payer swaption	\$\$	★★							
			Cap	\$\$	★★							
	Diversification	General Portfolio	Index (DB Ag FI)	\$	★★★★							
			Enhanced Index (PULSE)	\$\$	★★★★							
Corporates	Active	Credit Risk	CDX Index	\$\$	★★★★							
			CDX index options	\$	★★							
			Index Tranches	\$\$\$	★★							
Real Assets	Active	Real Estate Exposure	Swap on NCREIF	\$\$	★★							
		FX / Commodities	Options	\$	★★★							
			Futures	\$\$	★★★							
			Forwards	\$\$	★★★							
	Diversification	General Portfolio	Index (DBLCI)	\$	★★★							
			Enhanced Index (DB Hermes Enh. Comm. Inde)	\$\$\$	★★★							
			Enhanced Index (DB Matrix - Managed Futures)	\$\$\$	★★							
			Enhanced Index (Dow Jones UBS Booster)	\$\$\$	★★							
			Swap on Indices	\$	★★							
		TIPS	Index (TIPS) ETF	\$\$\$\$	★★							
Alternative Assets	Active	Hedge Fund Exposure	Option on Index (HFRI)	\$\$	★							

Table 3 (b): Asset Tail Risk Hedging Decision Table – Risks

What are we hedging?	Active hedging or Diversification?	What risk do we hedge?	What do we hedge with?	Systemic Risks					Other Risks		
				Instrument	Eq	FI	Commod	FX	Non-linearity	Operational	Counterparty
Domestic Equity	Active	Downturn / Volatility	Eq Option Collar	high	low	low	low	low	med	low	med
			Variance swaps	high	low	low	low	high	high	high	high
			Index EMERALD	high	low	low	low	low	low	low	low
			Index (ELVIS)	high	low	low	low	med	low	low	low
			Options on VIX	high	low	low	low	high	med	low	med
International Equity	Active	Downturn / Volatility	Eq Option Collar	high	low	low	low	low	med	low	med
			Variance swaps	high	low	low	low	high	high	high	high
		FX Risk	FX Option	low	low	low	high	high	med	high	med
			FX Index (MSCI EAFE FX HEDGE index)	low	low	low	high	low	low	low	low
Treasuries	Active	Inflation / Rate Increase	Payer swap	low	high	low	low	med	med	high	med
			Payer swaption	low	high	low	low	high	med	high	med
			Cap	low	high	low	low	low	med	high	med
	Diversification	General Portfolio	Index (DB Ag FI)	low	high	low	low	low	low	low	low
			Enhanced Index (PULSE)	low	high	low	low	low	low	low	low
Corporates	Active	Credit Risk	CDX Index	low	high	low	low	med	med	high	low
			CDX index options	low	high	low	low	high	med	high	high
			Index Tranches	low	high	low	low	med	med	high	med
Real Assets	Active	Real Estate Exposure	Swap on NCREIF	low	low	low	low	low	med	med	med
			FX / Commodities	Options	low	low	high	high	high	med	high
		Futures	low	low	high	high	low	med	low	med	
		Forwards	low	low	high	high	low	med	high	med	
	Diversification	General Portfolio	Index (DBLCI)	low	low	high	high	low	low	low	low
			Enhanced Index (DB Hermes Enh. Comm. Index)	low	low	high	high	low	low	low	low
			Enhanced Index (DB Matrix - Managed Futures)	low	med	med	med	low	low	low	low
			Enhanced Index (Dow Jones UBS Booster)	low	low	high	high	low	low	low	low
			Swap on Indices	low	depends on index swapped			low	med	med	med
			TIPS	Index (TIPS) ETF	low	high	low	low	low	low	low
Alternative Assets	Active	Hedge Fund Exposure	Option on Index (HFRI)	med	med	low	low	low	med	high	med

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